CRYOSAT Ground Segment

Instrument Processing Facility L1B

CryoSat Ice netCDF L1B Product Format Specification

[PFS-I-L1B]

C2-RS-ACS-ESL-5364

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Document Change Record

Issue/Rev.	**Class (R=Review /A=Approval)**	**Date**	**Reason for Change**	**Changed Pages/Paragraphs**
1.0draft	R	02/05/2016	First Issue	All
1.0	R	04/08/2016	First Official Issue	All
1.1	R	15/09/2016	Implementation of ESA comments The following variables names have been introduced: ant_bench_pitch_20_ku(time_20_ku) ant_bench_roll_20_ku(time_20_ku) ant_bench_yaw_20_ku(time_20_ku) dop_angle_start_20_ku(time_20_ku) dop_angle_stop_20_ku(time_20_ku) echo_scale_pwr_20_ku(time_20_ku) instr_ext_ph_cor_20_ku(time_20_ku) flag_cor_err_01(time_cor_01) flag_cor_status_01(time_cor_01) flag_echo_01(time_avg_01) flag_instr_conf_rx_bwdt_20_ku(time_20_ku) flag_instr_conf_rx_flags_20_ku(time_20_ku) flag_instr_conf_rx_in_use_20_ku(time_20_ku) flag_instr_conf_rx_str_in_use_20_ku(time_20_ku) flag_instr_conf_rx_trk_mode_20_ku(time_20_ku) flag_instr_mode_att_ctrl_20_ku(time_20_ku) flag_instr_mode_flags_20_ku(time_20_ku) flag_instr_mode_op_20_ku(time_20_ku) instr_cor_gain_rx_20_ku(time_20_ku) instr_cor_gain_tx_rx_20_ku(time_20_ku)	Section 3, appendix A

			instr_cor_range_rx_20_ku(time_20_ku) instr_cor_range_tx_rx_20_ku(time_20_ku) instr_seq_count_20_ku(time_20_ku) instr_int_ph_cor_20_ku(time_20_ku lat_01(time_avg_01) lon_avg_01_ku(time_avg_01_ku) ph_diff_waveform_20_ku(time_20_ku, ns_20_ku) pole_tide_01 pwr_waveform_01(time_avg_ku, ns_avg_01_ku) pwr_waveform_20_ku(time_20_ku, ns_20_ku) flag_surf_type_01(time_cor_01) time_avg_01(time_avg_01) flag_trk_cycle_20_ku(time_20_ku) window_del_01(time_avg_01) Unused variable types have been removed attribute comment added to eachCDL dump Appendix B and C have been added, former appendix B is now appendix D CDL dump of FBR variables added	Section 2.3 Section 3.3 Appendices B,C and D Section 3.3
1.2	R	19/09/2016	Harmonisation of variable names The following variables have been renamed: lon_01_ku(time_avg_01_ku) -> lon_avg_01_ku(time_avg_01_ku) pwr_waveform_01(time_avg_ku, ns_01_ku)->	Section 2.3, 3.1, 3.2, 3.3. and Appendix A and B

			pwr_waveform_01(time_avg_ku, ns_avg_01_ku) time_20_ku -> time_tai_20_ku time_21_ku-> time_tai_21_ku time_85_ku-> time_tai_85_ku time_avg_01_ku->time_tai_avg_01_ku time_cor_01_ku->time_tai_cor_01_ku The following dimension has been renamed: ns_01_ku-> ns_avg_01_ku Use of coordinate variables deleted Corrected table to give evidence of the unlimited variables used in the product Attributes "source" and "institution" added to geophysical correction variables when available	Section 2.3, 3.1, 3.2, 3.3. and Appendix A and B Section 2.2 Section 2.3 Section 3.3
1.3	R	03/10/2016	Appendix title added into description of the document structure Use of coordinate variables reintroduced Missing descriptions of global attributes have been added The following variables have been renamed: time_tai_20_ku-> time_20_ku	Section 1.2 Section 2.2 Section 2.3 Section 3.1, 3.2, 3.3.153->3.3.157 and Appendix A and B

			time_tai_21_ku -> time_21_ku time_tai_85_ku -> time_85_ku time_tai_avg_01_ku -> time_avg_01_ku time_tai_cor_01_ku-> time_cor_01_ku trasmit_pwr_XX_ku-> transmit_pwr_XX_ku	
			The dimension space_3d_ku has been renamed to space_3d.	Section 2.3, 3.1, 3.2, 3.3.153->3.3.157 and Appendix A and B
			Type of cplx_waveforms changed from int to byte	Section 3.3.21->3.3.26 and appendix B
			Attribute comment of variables flag_instr_mode_op_XX has been corrected	Section 3.3.67->3.3.69
			Attributes "source", "institution" and "comment" of the variable flag_surf_type have been modified	Section 3.3.73
			type (f) removed from values of add_offset and scale_factor	Section 3.3
1.4	R	10/10/2016	incorrect meas_noise_pwr replaced by noise_power in tables	Section 3.1.2 and 3.2.2
			Explanation how to link 20Hz records to 1-Hz ones added	Section 3.1
			Implementation of ESA's comments	Section 1.4, 3.3.8, 3.3.11->13, 3.3.21->26, 3.3.29->31, 3.3.47->53, 3.3.55->63, 3.3.78->84,3.3.91->96, 3.3.99, 3.3.104, 3.3.110->113, 3.3.115->118, 3.3.120, 3.3.121, 3.3.144, 3.3.145, 3.3.147, 3.3.148, 3.3.152,

				3.3.154, 3.3.155, 3.3.170, 3.3.173
1.5	R	27/01/2017	The variable: seq_count_20_ku is put in every L1b product CDL dumps reviewed to assure homogeneity among products	Appendix A Section 3
1.6	R	25/05/2017	Type error commment corrected in comment Reference to CoG or Centre of Mass replaced with CoM Variables: agc_1_21_ku and agc_2_21_ku added Variables: agc_ch1_85_ku and agc_ch2_85_ku changed in agc_1_85_ku and agc_2_85_ku Variables "long_name" modified Variables "comment" modified	Sections 3.3.21 ->3.3.35 Section 3.3.38 Sections 3.3.42 ->3.3.44 Section 3.3.46 ->3.3.54 Section 3.3.74 Sections 3.3.119 ->3.3.123 Section 3.3.133 Section 3.3.135 Sections 3.3.144 ->3.3.152 Sections 3.1.1, 3.1.4, 3.2.1, 3.3.7->3.3.10, 3.3.90->3.3.92, 3.3.125, 3.3.126, 3.3.171 abd 3.3.172 Sections 3.3.1 and 3.3.3 added Sections 3.3.2 and 3.3.4 Sections 3.3.22, 3.3.30 -> 3.3.32, 3.3.40, 3.3.43, 3.3.100, 3.3.102, 3.3.107, 3.3.114, 3.3.119, 3.3.120, 3.3.124 -> 3.3.126, 3.3.130, 3.3.133 -> 3.3.135, 3.3.142 and 3.3.170 -> 3.3.173 3.3.5 -> 3.3.13, 3.3.15 -> 3.3.17, 3.3.29, 3.3.32, 3.3.37, 3.3.40, 3.3.41, 3.3.43 -> 3.3.51, 3.3.55 -> 3.3.69, 3.3.80 -> 3.3.89, 3.3.95 -> 3.3.111, 3.3.114 -> 3.3.120, 3.3.124 -> 3.3.126, 3.3.130, 3.3.133 -> 3.3.139, 3.3.142, 3.3.147, 3.3.153 -> 3.3.157 and 3.3.168 -> 3.3.173,
1.7	R	06/06/2017	Variables "comment" modified	Sections 3.3.24, 3.3.25, 3.3.87 -> 3.3.89, 3.3.112 and 3.3.113

1.8	R	04/12/2018	Release for Baseline D implementation Global Attributes nomenclature aligned to COP Processor specification New fields added to track measurement index: ind_first_meas_20hz_01 and ind_meas_1hz_20_ku C2-MN-ACS-ESL-5376 "CS2 Baseline D Pre-acceptance Minutes of Meeting" Section 3.4 Added All Section doi global attribute added in Global Attributes	Front page: document ID fixed in C2-RS-ACS-ESL-5364 CCN#5 implementation Section 3.4 Section 3 Appendix D: XML Header Product File rationale clarified and details for field description provided Flag meaning definition reported from EEF Format documentation CS-RS-ACS-GS-5106 Issue: 6.4 Coordinates attribute added for all the variables Section 6.3
2.0draft			Section 3 CRYO-IDE-320 Instrument range correction update CRYO-IDE-309 1Hz Average waveforms filed update CRYO-IDE-308 Window Delay Comment update CRYO-IDE-301 Adding variables lat_cor_01 lon_cor_01 to L1b products CRYO-IDE-303 Adding PLRM @20Hz to ICE L1b products CRYO-IDE-249 L1b-S	

			Stack Product for CryoSat CRYO-IDE-328 Stack Zero Mask Annex A: plrm variables added to the table Annex E introduced	

TABLE OF CONTENTS

1 INTRODUCTION

This document specifies the netCDF format of the Level-1B products generated by the CryoSat ice processing chains. This new specification is called CONFORM: CryOsat Netcdf FORMat.

1.1 PURPOSE AND SCOPE

The purpose of the document is to specify the netCDF product structure and content of the Level-1B products generated by the CryoSat ice processor.

Since the beginning of the mission (2010), all CryoSat products had been generated in Earth Explorer (EE) bespoke format devised for the CryoSat products at the time of the CryoSat-1 mission and derived from the ENVISAT products format with the purpose to maximise the reuse of decoding/analysis tools developed for this mission. In 2015 the Agency decided to migrate from this Earth Explorer format to the more flexible and up-to-date netCDF model for those products that are intended to be distributed to the users.

This new format is called CONFORM (CryOsat Netcdf FORMat) and is applicable to the following ice products:

- LRM Level 1B
- SAR Level 1B
- SARIn Level 1B
- SAR FBR
- SARIn FBR

The FDM Level 1B product is decommissioned since Baseline D installation (CRYO-IDE-270)

The first product baseline available in netCDF for all users is Baseline-D.

1.2 DOCUMENT STRUCTURE

The document includes the following sections:

Section 1 – Introduction	Introduction to the whole document
Section 2 - General Overview	This section gives an overview of the CryoSat IPF1 ice production as well as a short introduction to the netCDF.
Section 3 - Product Format Specification	This section contains the specification of the FBR and L1B ice CONFORM products. In particular: • Section 3.1 lists the variables of the L1B products and links each of them to the relevant CDL dump • Section 3.2 lists the variables of the FBR products and links each of them to the relevant CDL dump • Section 3.3 contains the CDL dump of each variable • Section 3.4 specifies the global attributes of each product
Section 4- CryoSat Level-1B CONFORM Products	Here is the list of the L1B CONFORM ice products
Appendix A – Variables to Products Mapping	This section provides a variable name list ordered alphabetically and showing for each variablewhich product types it can be found in.
Appendix B: Default Setting of the Attribute: _FillValue	This section lists the _FillValues for each variable type
Appendix C: Timestamps Data Type	This section describes the timestamps used in the CONFORM products are reliable till January 2034
Appendix D - EE to netCDF Migration	This section contains a short description of the general rules followed to migrate from the EE format to CONFORM

1.3 APPLICABLE & REFERENCE DOCUMENTS

1.3.1 Applicable Documents

Document Title	Identifier	Reference
CCN #3: CONFORM [IPF1-CCN3] Issue 1.0	C2-CN-ACS-GS-5343	[CCN3-TN]
Minute of CCN#3 and CCN#4 KO meeting	C2-MN-ACS-GS-5248	[CCN3-KO]

1.3.2 Reference Documents

Document Title	Identifier	Reference
IPF1 Detailed Processing Model Issue 4.2, April 2015	CS-TN-ACS-GS-5105	[IPF1-DPM]
Level 0 Products Specification Format Issue 3.1, November 2007	CS-ID-ACS-GS-0119	[L0-FMT]
IEEE Standard for Binary Floating-Point Arithmetic. ANSI/IEEE Std 754-1985 Institute of Electrical and Electronics Engineers Issued 1985	IEEE-754	[IEEE]
CCSDS Recommendation Time Code Formats Blue Book Issue 2.0, April 1990	CCSDS 301.0-B-2	[CCSDS-TIMEGUIDE]
CCSDS Recommendation Advanced Orbiting System, Networks and Data Links Architectural Specification Blue Book Issue 3.0, June 2001	CCSDS 701.0-B-3	[CCSDS-AOS]

1.4 ACRONYMS AND ABBREVIATIONS

ACS	Advanced Computer Systems S.p.A.
AGC	Automatic Gain Control
CAL	Calibration
CCAL	Complex Calibration
CCSDS	Consultative Committee for Space Data Systems
CONFORM	CryOsat Netcdf FORMat
DFCB	Data Format Control Book
DSR	Data Set Record
DOI	Digital Object Identifier
EE	Earth Explorer
ESA	European Space Agency
FOS	Flight Operations Segment
FBR	Full Bit Rate
GS	Ground Segment
HK/TM	Housekeeping/Telemetry data
ID	IDentifier
IPF	Instrument Processing Facility
ISP	Instrument Source Packet
L1B	Level 1B
LRM	Low Rate Mode
MDS	Measurement Data Set
MDSR	Measurement Data Set Record
MON	Monitoring
MPH	Main Product Header
NetCDF	Network Common Data Form
NPM	Noise Power Measurement
PDS	Payload Data System
PFS	Product Format Specification
RC	Radar Cycle
SAR	Synthetic Aperture Radar
SARIn	Synthetic Aperture Radar Interferometry
SIRAL	Synthetic Interferometric Radar ALtimeter
SPH	Specific Product Header
STR	Star Tracker

S6 GPP	Sentinel 6 Ground Processing Prototype
TAI	International Atomic Time Reference
TBD	To Be Defined
TRK	TRacKing
UTC	Universal Time Co-ordinates
WGS84	World Geodetic System 1984

2 GENERAL OVERVIEW

2.1 OVERVIEW OF THE IPF1 ICE PRODUCTION

The Level 1 products are generated from the SIRAL instrument Level 0 data by applying the IPF1 processing algorithms defined in the IPF1 system of PDS.

The IPF1 processing chains provide four types of Level 1 products:

❒ **Level 1B (L1B)**

The L1B data is the main product output from the IPF1. In the case of SAR and SARIn modes of SIRAL, the L1B data are strongly compressed in size following the application of SAR/SARIn algorithms and multilook for speckle reduction.

❒ **Level 1B Calibration (CAL)**

CAL1 and CAL2 products also belong to the L1B class. CAL1 data are available for LRM/SAR/SARIn modes, while CAL2 data are available only for SAR/SARIn modes.

❒ **Full Bit Rate (FBR)**

The FBR product is output at an intermediate stage before the L1B processing is complete. This is the highest processing stage reached before information compression occurs. In particular the FBR data for SAR and SARIn modes still contain the echo data as complex numbers.

❒ **Monitoring (MON)**

Monitoring data is a systematic product aiming to provide timely information on the health of the instrument. It consists of a set of instrument parameters which may be produced rapidly and routinely starting from LRM/TRK SIRAL data, SAR or SARIn data.

❒ **Level 1B Science Stack(L1Bs)**

L1b-S Stack products (in SAR/SARin) is useful for the end users, providing as much complete as possible stack information. This is considered an optional product.

The IPF1 has as output the following products:

- **Level 1B Science Data**
    - LRM Level 1B generated and distributed in CONFORMSAR Level 1B generated and distributed in CONFORM
    - SARIn Level 1B generated and distributed in CONFORM
    - SAR Level 1B Stack generated and distributed in CONFORM
    - SARin Level 1B Stack generated and distributed in CONFORM
- **FBR Science Data**

  - LRM FBR generated, but no more distributed, in Earth Explorer format
  - SAR FBR generated and distributed in CONFORM
  - SARIn FBR generated and distributed in CONFORM
- **Auxiliary Calibration Data**
  - CAL1 LRM generated and distributed in Earth Explorer format
  - CAL1 SAR generated and distributed in Earth Explorer format
  - CAL1 SARIn generated and distributed in Earth Explorer format
  - CAL2 SAR generated and distributed in Earth Explorer format
  - CAL2 SARIn generated and distributed in Earth Explorer format
  - Complex CAL1 SARIn generated and distributed in Earth Explorer format
- **Monitoring Products**
  - MON LRM/TRK generated and distributed in Earth Explorer format
  - MON SAR generated and distributed in Earth Explorer format
  - MON SARIn generated and distributed in Earth Explorer format

The Earth Explorer format of the products is specified in [PROD-FMT].

2.2 OVERVIEW OF THE NETCDF

NetCDF (Network Common Data Form) is a set of software libraries and self-describing, machine-independent data formats that support the creation, access, and sharing of array-oriented scientific data.

The version of the netCDF libraries used for the CryoSat ice production is **NetCDF-4 CF compliant** and consists of the following elements:

- DIMENSIONS:
  A dimension is used to represent a real physical dimension (for example, time, latitude, longitude, and height) or to index other quantities (for example number of records or waveforms or samples). A dimension can also be used to index other quantities (waveforms index for example).A netCDF dimension has both a name and a length and can be limited or unlimited (i.e. a dimension that can be appended to).

- VARIABLES:
  Variables are used to store the bulk of the data in a netCDF dataset. A variable represents an array of values of the same type. A scalar value is treated as a 0-dimensional array. A variable has a name, a data type, and a shape described by its list of dimensions specified when the variable is created. A variable may also have associated attributes, which may be added, deleted or changed after the variable is created.

- COORDINATE VARIABLES:
  A variable can have the same name as a dimension and in this case the variable is called a coordinate variable. It typically defines a physical coordinate corresponding to that dimension. If a dimension has a corresponding coordinate variable, then this provides an alternative, and often more convenient, means of specifying a position along it. Current application packages that make use of coordinate variables commonly assume they are numeric vectors and strictly monotonic (all values are different and either increasing or decreasing).

- ATTRIBUTES:
  Attributes are used to store information about the data (ancillary data or metadata). Most attributes provide information about a specific variable. These are identified by the name (or ID) of that variable, together with the name of the attribute.

- GLOBAL ATTRIBUTES:
  Some attributes provide information about the dataset as a whole and are called global attributes. In particular, the global attributes used in the CryoSat products contains the information that was present in the EE header (see [PROD-FMT]).

2.3 NETCDF PRIMITIVES

The following **dimensions** are used in the CryoSat ice Level-1B CONFORM products:

Dimensions					
Name	Description	Size	Units	Type	Limited/ Unlimited
time_20_ku	Timestamps of 20 Hz power waveforms in the L1B product file (L1B only)	Number of 20 Hz power waveforms in the product file	seconds since 2000-01-01 00:00:00.0	double	Unlimited
time_21_ku	Timestamps of 21 Hz Complex echo waveforms in the SARIn FBR product file (FBR only)	Number of 21 Hz Complex echo waveforms in the SARIn FBR product file	seconds since 2000-01-01 00:00:00.0	double	Unlimited
time_85_ku	Timestamps of 85 Hz Complex echo waveforms in the SAR FBR product file (FBR only)	Number of 85 Hz Complex echo waveforms in the SAR FBR product file	seconds since 2000-01-01 00:00:00.0	double	Unlimited
time_avg_01_ku	Timestamps of 1 Hz avg power waveforms in the L1b product file (L1B only)	Number of 1 Hz power waveforms in the product file	seconds since 2000-01-01 00:00:00.0	double	Unlimited
time_plrm_01_ku	Timestamps of 20 Hz plrm power waveforms in the L1b product file (L1B only)	Number of 1 Hz power waveforms in the product file	seconds since 2000-01-01 00:00:00.0	double	Unlimited
time_plrm_20_ku	Timestamps of 20 Hz plrm power waveforms in the L1b product file (L1B only)	Number of 20 Hz power waveforms in the product file	seconds since 2000-01-01 00:00:00.0	double	Unlimited
time_cor_01	Timestamps of 1 Hz Geophysical corrections in the product file	Number of 1 Hz Geophysical corrections in the product file	seconds since 2000-01-01 00:00:00.0	double	Unlimited
np_ku	Number of pulses in 1 burst of complex echo waveforms (FBR only)	Number of pulses in 1 burst of complex echo waveforms	count	short	Limited
ns_ku	Number of samples	Number of samples	count	short	Limited

Dimensions					
Name	Description	Size	Units	Type	Limited/ Unlimited
	in 1 complex echo waveform (FBR only)	in 1 complex echo waveform			
ns_20_ku	Number of samples in a 20Hz waveform (L1B only)	Number of samples in a 20Hz waveform	count	short	Limited
ns_avg_01_ku	Number of samples in a 1Hz averaged waveform (L1B only)	Number of samples in a 1Hz averaged waveform	count	short	Limited
ns_plrm_01_ku	Number of samples in a 1Hz plrm waveform (L1B only)	Number of samples in a 1Hz plrm waveform	count	short	Limited
ns_plrm_20_ku	Number of samples in a 20Hz plrm waveform (L1B only)	Number of samples in a 20Hz plrm waveform	count	short	Limited
space_3d	3 dimensions of space (x,y,z)	3	count	short	Limited
nlooks_ku	Number of looks in a stack		count	short	Limited

The following **variables** are used in the CryoSat ice Level-1b CONFORM products:

Variables	
Name	Description
byte	8-bit data signed
short	16-bit signed integer
ushort	16-bit unsigned integer
int	32-bit signed integer
int64	64-bit signed integer
double	IEEE double precision floating point (64 bits)

The following **attributes** are used in the CryoSat ice Level-1b CONFORM products:

Variable Attributes	
Name	Description
add_offset	According to the netCDF

Variable Attributes	
Name	Description
scale_factor	standard, the value in the specified unit is computed as: value_unit = (value_product * scale_factor) + add_offset
calendar	Reference time calendar
comment	The "comment" attribute allows for miscellaneous information about the dataset.
_FillValue	A value used to represent missing or undefined data add_offset If present, this number is to be added to the date
flag_meanings	Use in conjunction with flag_values to provide descriptive words or phrase for each flag value.
Flag_values	Provide a list of the flag values. Use in conjunction with flag_meanings.
Institution	Institution which provides the data
long_name	A long descriptive name for the variable (not necessarily from a controlled vocabulary).
Source	Data source (model features, or observation)
standard_name	A long descriptive name for the variable taken from a controlled vocabulary of variable names (when applicable)
units	The units of the variables data values. This attributes value should be a valid units string.

3 PRODUCT FORMAT SPECIFICATION

3.1 L1B PRODUCT SPECIFICATION – LIST OF VARIABLES

The contents of the CryoSat science products can be logically grouped in:

1. Time and Orbit Information
2. Measurements
3. External Corrections
4. **Average Waveforms**
5. Waveforms

for LRM products and in:

1. Time and Orbit Information
2. Measurements
3. External Corrections
4. **PLRM Waveforms Group**
5. Waveforms

for SAR/SARin products.

This logical classification could be implemented in the netCDF 4.0 model by means of a specific structure called **group**, however this feature is not used in the CryoSat products because users could be forced to update their existing analysis/visualisation tools in order to keep up with these new netCDF features.

Nevertheless, the logic behind this grouping is kept in the definition of the products and the rest of this section will follow this hierarchy for the format specification.

Another difference to the EE format to highlight is that the CryoSat netCDF products don't contain the blank records that were needed in the EE format to keep the binary structure consistent.

This means that there are no longer exactly 20 x 20 Hz records for every 1 Hz record and therefore the only way to associate 1 Hz to 20 Hz quantities is by means of the time stamps: the record whose 20 Hz time stamp holds the same as the 1 Hz time stamp is the first record in a group of up to 20 x 20 Hz records.

Before entering the details of the Product Format Definition please bear in mind that:

- Only signed types are used unless strictly required otherwise.
- The long-name has been kept from the field description in [PROD-FMT]

3.1.1 Time and Orbit Group

Time and Orbit Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
1. T0	time_20_ku(time_20_ku) *time in TAI: seconds since 1 Jan 2000*	s	time	Data Record Time (MDSR Time Stamp)
2. T1	uso_cor_20_ku(time_20_ku) *uso correction applied to window delay (2-way)*			USO correction factor
3. T2	flag_instr_mode_op_20_ku(time_20_ku) *mode id – identifies the siral instrument measurement mode*	FLAG		Mode ID – ID 1
4. T3	flag_instr_mode_att_ctrl_20_ku(time_20_ku) *mode id: Platform Attitude Control*	FLAG		Mode ID – ID 5
5. T4	flag_instr_mode_flags_20_ku(time_20_ku) *mode id – identifies the sarin degraded case and the CAL4 flag*	FLAG		Mode ID – ID 2, ID 4
6. T5	seq_count_20_ku(time_20_ku) *Source Sequence Counter*	count		Source Sequence Counter
7. T6	flag_instr_conf_rx_in_use_20_ku(time_20_ku) *instrument configuration rx chain in use*	FLAG		Instrument Configuration

Time and Orbit Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
8. T7	flag_instr_conf_rx_bwdt_20_ku(time_20_ku) *instrument configuration: acquisition band*	FLAG		Instrument Configuration
9. T8	flag_instr_conf_rx_trk_mode_20_ku(time_20_ku) *instrument configuration : tracking mode*	FLAG		Instrument Configuration
10. T9	flag_instr_conf_rx_str_in_use_20_ku(time_20_ku) *instrument configuration: str in use*	FLAG		Instrument Configuration
11. T10	flag_instr_conf_rx_flags_20_ku(time_20_ku) *instrument configuration flags*	FLAG		Instrument Configuration
12. T11	rec_count_20_ku(time_20_ku) *record counter*	count		Burst counter
13. T12	lat_20_ku(time_20_ku) *20 Hz latitude*	deg_north	latitude	Latitude of measurement
14. T13	lon_20_ku(time_20_ku) *20 Hz longitude*	deg_east	longitude	Longitude of measurement
15. T14	alt_20_ku(time_20_ku) *altitude of the Satellite CoM above reference ellipsoid.*	M	height_above_reference_ellipsoid	Altitude of CoG above reference ellipsoid

Time and Orbit Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**unit s**	**Standard_name**	**EE Field**
16. T15	orb_alt_rate_20_ku(time_20_ku) *Altitude rate of the Satellite CoM with respect to the reference ellipsoid*	m/s		Instantaneous altitude rate derived from orbit Satellite velocity vector
17. T16	sat_vel_vec_20_ku(time_20_ku,space_3d) *velocity vector in itrf*	m/s		Satellite velocity vector[3] (in ITRF)
18. T17	beam_dir_vec_20_ku(time_20_ku,space_3d) *real beam direction vector in CRF*	m		Real beam direction vector[3] (in CRF)
19. T18	inter_base_vec_20_ku(time_20_ku,space_3d) *interferometric baseline direction vector in CRF*	m		Interferometer baseline vector[3] (in CRF)
20. T19	off_nadir_roll_angle_str_20_ku (time_20_ku) *antenna bench roll angle*	deg		Antenna Bench Roll Angle
21. T20	off_nadir_pitch_angle_str_20_ku (time_20_ku) *antenna bench pitch angle*	deg		Antenna Bench Pitch Angle
22. T21	off_nadir_yaw_angle_str_20_ku(time_20_ku) *antenna bench yaw angle*	deg		Antenna Bench Yaw Angle
23. T22	flag_mcd_20_ku (time_20_ku) *measurement confidence flags*	FLAG		Level 1b Measurement Confidence Data (flag word)

Time and Orbit Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
24. T23	ind_first_meas_20hz_01(time_cor_01) *index of the first 20Hz measurement: 1 Hz*	count		
25. T24	ind_meas_1hz_20_ku(time_20_ku) *index of the 1Hz measurement: 20 Hz ku band*	count		

3.1.2 Measurements Group

Measurements Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
1. M0	window_del_20_ku(time_20_ku) *calibrated window delay (2way)*	s		Window Delay (2way) corrected for instrument delays
2. M1	h0_applied_20_ku(time_20_ku) *h0 initial height word*	s		H0 Initial Height Word
3. M2	cor2_applied_20_ku(time_20_ku) *cor2 height rate*	s		COR2 Height Rate
4. M3	h0_lai_word_20_ku(time_20_ku) *coarse range word lai*	s		Coarse Range word LAI
5. M4	h0_fai_word_20_ku(time_20_ku) *fine word fai*	s		Fine Range word FAI
6. M5	agc_ch1_20_ku(time_20_ku) *agc gain applied on rx channel 1. Gain calibration corrections are applied*	dB		AGC Channel 1 (corrected)
7. M6	agc_ch2_20_ku(time_20_ku) *agc gain applied on rx channel 2. Gain calibration corrections are applied*	dB		AGC Channel 2 (corrected)
8. M7	tot_gain_ch1_20_ku(time_20_ku) *total fixed gain on channel 1*	dB		Total Fixed Gain Rx 1
9. M8	tot_gain_ch2_20_ku(time_20_ku) *total fixed gain on channel 2*	dB		Total Fixed Gain Rx 2

Measurements Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
10. M9	transmit_pwr_20_ku(time_20_ku) *transmitted power*	Watt		Transmit Power
11. M10	dop_cor_20_ku(time_20_ku) *doppler range correction*	m		Doppler range correction (Radial component)
12. M11	instr_cor_range_tx_rx_20_ku(time_20_ku) *1-way instrument range correction (tx-rx chain)*	m		Instrument Range Correction tx-rx antenna
13. M12	instr_cor_range_rx_20_ku(time_20_ku) *1-way instrument range correction (rx only chain)*	m		Instrument Range Correction rx only antenna
14. M13	instr_cor_gain_tx_rx_20_ku(time_20_ku) *instrument gain correction (tx-rx chain)*	dB		Instrument Gain Correction tx-rx antenna
15. M14	instr_cor_gain_rx_20_ku(time_20_ku) *instrument gain correction (rx only chain)*	dB		Instrument Gain Correction rx only antenna
16. M15	instr_int_ph_cor_20_ku(time_20_ku) *internal phase correction computed from the cal-4* *(FillValue in LRM and SAR cases)*	rad		Internal Phase Correction

Measurements Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
17. M16	instr_ext_ph_cor_20_ku(time_20_ku) *external phase correction taken from the ipfdb file* *(FillValue in LRM and SAR cases)*	rad		External Phase Correction
18. M17	noise_power_20_ku(time_20_ku) *noise power measurement*	dB		Noise power measurement
19. M18	ph_slope_cor_20_ku(time_20_ku) *phase slope correction* *(FillValue in LRM and SAR cases)*	rad		Phase Slope Correction

3.1.3 External Corrections Group

Corrections Group				
ID	**Variable Name(dim1,..,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
1. C0	time_cor_01(time_cor_01) *time in TAI: seconds since 1 Jan 2000*	s	time	
2. C1	lat_cor_01_ku(time_cor_01_ku) *latitude of corrections*	degrees_north	latitude	
3. C2	lon_cor_01_ku(time_cor_01_ku) *longitude of corrections*	degrees_east	longitude	
4. C3	mod_dry_tropo_cor_01(time_cor_01) *dry tropospheric correction (1-way)*	m	altimeter_range_correction_due_to_dry_troposphere	Dry Tropospheric Correction
5. C4	mod_wet_tropo_cor_01(time_cor_01) *wet tropospheric correction (1-way)*	m	altimeter_range_correction_due_to_wet_troposphere	Wet Tropospheric Correction
6. C5	inv_bar_cor_01(time_cor_01) *inverse barometric correction (1-way)*	m	sea_surface_height_correction_due_to_air_pressure_at_low_frequency	Inverse Barometric Correction
7. C6	hf_fluct_total_cor_01(time_cor_01) *1-way dynamic atmospheric correction*	m	sea_surface_height_correction_due_to_air_pressure_and_wind_at_high_frequency	Dynamic Atmospheric Correction

Corrections Group				
ID	**Variable Name(dim1,..,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
8. C7	iono_cor_gim_01(time_cor_01) *gim ionospheric correction (1-way)*	m	altimeter_range_correction_due_to_ionosphere	GIM Ionospheric Correction
9. C8	iono_cor_01(time_cor_01) *model ionospheric correction (1-way)*	m	altimeter_range_correction_due_to_ionosphere	Model Ionospheric Correction
10. CC9	ocean_tide_01 (time_cor_01) *elastic ocean tide (1-way)*	m	sea_surface_height_amplitude_due_to_geocentric_ocean_tide	Elastic Ocean Tide
11. CC10	ocean_tide_eq_01(time_cor_01) *long period ocean tide (1-way)*	m	sea_surface_height_amplitude_due_to_equilibrium_ocean_tide	Long Period Ocean Tide
12. C11	load_tide_01(time_cor_01) *ocean loading tide (1-way)*	m		Ocean Loading Tide
13. C12	solid_earth_tide_01(time_cor_01) *solid earth tide (1-way)*	m	sea_surface_height_amplitude_due_to_earth_tide	Solid Earth Tide
14. C13	pole_tide_01(time_cor_01) *geocentric polar tide (1-way)*	m	sea_surface_height_amplitude_due_to_pole_tide	Geocentric Polar Tide
15. C14	surf_type_01(time_cor_01) *surface type: 1 Hz*	count		Surface type flag
16. C15	flag_cor_status_01(time_cor_01) *correction status flags*	FLAG		Correction status flags

Corrections Group				
ID	**Variable Name(dim1,..,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
17. C16	flag_cor_err_01(time_cor_01) *correction error flags*	FLAG		Correction error flags

3.1.4 PLRM Waveforms Group (for SAR/SARin only)

Average Waveform group				
ID	**Variable Name (dim1,...,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
1.	time_plrm_01_ku(time_plrm_01_ku) *time in TAI: seconds since 1 Jan 2000*	s	time	Data Record Time (MDSR Time Stamp)
2.	uso_cor_plrm_01_ku(time_plrm_01_ku) *uso correction applied to window delay (2-way)*	s		
3.	lat_plrm_01_ku(time_plrm_01_ku) *latitude of measurement*	degrees_north	latitude	Latitude of measurement
4.	lon_plrm_01_ku(time_plrm_01_ku) *longitude of measurement*	degrees_east	longitude	Longitude of measurement
5.	alt_plrm_01_ku(time_plrm_01_ku) *altitude of the Satellite CoM above reference ellipsoid*	m	height_above_reference_ellipsoid	Altitude of CoM above reference ellipsoid (interpolated value)

Average Waveform group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
6.	window_del_plrm_01_ku(time_plrm_01_ku) *calibrated window delay (2-way)*	s		Window Delay (2way) corrected for instrument delays
7.	pwr_waveform_plrm_01_ku(time_plrm_01_ku,ns_plrm_01_ku) *1hz l1b power waveform scaled 0-65535*	count		1 Hz Averaged Power Echo Waveform
8.	echo_scale_factor_plrm_01_ku(time_plrm_01_ku) *echo scale factor (to scale echo to watts)*	count		Echo Scale Factor (to scale echo to watts)
9.	echo_scale_pwr_plrm_01_ku(time_plrm_01_ku) *echo scale power (a power of 2)*	count		Echo Scale Power (a power of 2)
10.	echo_numval_plrm_01_ku(time_plrm_01_ku) *number of echoes averaged*	count		Number of echoes averaged
11.	flag_echo_plrm_01_ku(time_plrm_01_ku) *flags for errors or information about 1hz average power waveform*	FLAG		Flags
12.	time_plrm_20_ku(time_plrm_20_ku) *time in TAI: seconds since 1 Jan 2000*	s	time	

Average Waveform group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
13.	uso_cor_plrm_20_ku(time_plrm_20_ku) *uso correction applied to window delay (2-way)*	s		
14.	lat_plrm_20_ku(time_plrm_20_ku) *latitude of measurement*	degrees_north	latitude	
15.	lon_plrm_20_ku(time_plrm_20_ku) *longitude of measurement*	degrees_east	longitude	
16.	alt_plrm_20_ku(time_plrm_20_ku) *altitude of the Satellite CoM above reference ellipsoid*	m	height_above_reference_ellipsoid	
17.	window_del_plrm_20_ku(time_plrm_20_ku) *calibrated window delay (2-way)*	s		
18.	pwr_waveform_plrm_20_ku(time_plrm_20_ku,ns_plrm_20_ku) *1hz l1b power waveform scaled 0-65535*	count		
19.	echo_scale_factor_plrm_20_ku(time_plrm_20_ku) *echo scale factor (to scale echo to watts)*	count		
20.	echo_scale_pwr_plrm_20_ku(time_plrm_20_ku) *echo scale power (a power of 2)*	count		

Average Waveform group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
21.	echo_numval_plrm_20_ku(time_plrm_20_ku) *number of echoes averaged*	count		
22.	flag_echo_plrm_20_ku(time_plrm_20_ku) *flags for errors or information about 20hz average power waveform*	FLAG		

3.1.5 Average Waveforms Group (for LRM only)

Average Waveform group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
1.	time_avg_01_ku(time_avg_01_ku) *time in TAI: seconds since 1 Jan 2000*	s	time	Data Record Time (MDSR Time Stamp)
2.	uso_cor_avg_01_ku(time_avg_01_ku) *uso correction applied to window delay (2-way)*	s		
3.	lat_avg_01_ku(time_avg_01_ku) *latitude of measurement*	degrees_north	latitude	Latitude of measurement
4.	lon_avg_01_ku(time_avg_01_ku) *longitude of measurement*	degrees_east	longitude	Longitude of measurement

Average Waveform group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
5.	alt_avg_01_ku(time_avg_01_ku) *altitude of the Satellite CoM above reference ellipsoid*	m	height_above_reference_ellipsoid	Altitude of CoM above reference ellipsoid (interpolated value)
6.	window_del_avg_01_ku(time_avg_01_ku) *calibrated window delay (2-way)*	s		Window Delay (2way) corrected for instrument delays
7.	pwr_waveform_avg_01_ku(time_avg_01_ku,ns_avg_01_ku) *1hz l1b power waveform scaled 0-65535*	count		1 Hz Averaged Power Echo Waveform
8.	echo_scale_factor_avg_01_ku(time_avg_01_ku) *echo scale factor (to scale echo to watts)*	count		Echo Scale Factor (to scale echo to watts)
9.	echo_scale_pwr_avg_01_ku(time_avg_01_ku) *echo scale power (a power of 2)*	count		Echo Scale Power (a power of 2)
10.	echo_numval_avg_01_ku(time_avg_01_ku) *number of echoes averaged*	count		Number of echoes averaged
11.	flag_echo_avg_01_ku(time_avg_01_ku) *flags for errors or information about 1hz average power waveform*	FLAG		Flags

3.1.6 Waveforms Group

Waveform group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
1.	pwr_waveform_20_ku(time_20_ku,ns_20_ku) *l1b power waveform scaled 0-65535*	count		Averaged Power Echo Waveform [128]
2.	echo_scale_factor_20_ku(time_20_ku) *echo scale factor (to scale echo to watts)*	count		Echo Scale Factor (to scale echo to watts)
3.	echo_scale_pwr_20_ku(time_20_ku) *echo scale power (a power of 2)*	count		Echo Scale Power (a power of 2)
4.	echo_numval_20_ku(time_20_ku) *number of echoes averaged*	count		Number of echoes averaged
5.	flag_echo_20_ku(time_20_ku) *flags for errors or information about L1b 20Hz power waveform*	FLAG		Flags
6.	flag_trk_cycle_20_ku(time_20_ku) *trk cycle report (as extracted from the L0)* *LRM only*	count		TRK Report
7.	stack_std_20_ku (time_20_ku) *Gaussian power fitting: std wrt beam number* *(FillValue in LRM case)*	count		Beam behaviour parameter
8.	stack_centre_20_ku (time_20_ku) *gaussian power fitting: center wrt beam number* *(FillValue in LRM case)*	count		

Waveform group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
9.	stack_scaled_amplitude_20_ku(time_20_ku) *gaussian power fitting: amplitude* *(FillValue in LRM case)*	dB		
10.	stack_skewness_20_ku(time_20_ku) *gaussian power fitting: skewness wrt beam number* *(FillValue in LRM case)*	count		
11.	stack_kurtosis_20_ku(time_20_ku) *gaussian power fitting: kurtosis wrt beam number* *(FillValue in LRM case)*	count		
12.	stack_std_angle_20_ku(time_20_ku) *gaussian power fitting: std wrt boresight angle* *(FillValue in LRM case)*	rad		
13.	stack_centre_angle_20_ku(time_20_ku) *gaussian power fitting: center wrt boresight angle* *(FillValue in LRM case)*	rad		
14.	stack_centre_look_angle_20_ku(time_20_ku) *gaussian power fitting: center wrt look angle* *(FillValue in LRM case)*	rad		

Waveform group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
15.	stack_gaussian_fitting_residuals_20_ku(time_20_ku) *gaussian power fitting: residuals fitting* *(FillValue in LRM case)*	rad		
16.	dop_angle_start_20_ku(time_20_ku) *doppler angle start* *(FillValue in LRM case)*	Rad		
17.	dop_angle_stop_20_ku(time_20_ku) *doppler angle stop* *(FillValue in LRM case)*	rad		
18.	look_angle_start_20_ku(time_20_ku) *look angle start* *(FillValue in LRM case)*	rad		
19.	look_angle_stop_20_ku(time_20_ku) *look angle stop* *(FillValue in LRM case)*	rad		
20.	stack_number_after_weighting_20_ku(time_20_ku) *number of contributing beams in the stack after weighting* *(FillValue in LRM case)*	count		Beam behaviour parameter
21.	stack_number_before_weighting_20_ku(time_20_ku) *number of contributing beams in the stack before weighting* *(FillValue in LRM case)*	count		Beam behaviour parameter

Waveform group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
22.	stack_peakiness_20_ku(time_20_ku) *Stack peakiness*	count		
23.	stack_mask_start_stop_20_ku(time_20_ku, nlooks_ku) *Zero-mask between the start and stop looks within the stack.*	Count		
24.	coherence_waveform_20_ku(time_20_ku,ns_20_ku) *l1b coherence waveform* *(FillValue in LRM and SAR cases)*	Count		Coherence [1024]
25.	ph_diff_waveform_20_ku(time_20_ku, ns_20_ku) *l1b Phase Difference waveform* *(FillValue in LRM and SAR cases)*	rad		Phase difference [1024]

3.2 L1BS PRODUCT SPECIFICATION – LIST OF VARIABLES

The contents of the CryoSat science stack products can be logically grouped in:

1. Time and Orbit Information
2. Measurements
3. Waveforms

This logical classification could be implemented in the netCDF 4.0 model by means of a specific structure called **group**, however this feature is not used in the CryoSat products because users could be forced to update their existing analysis/visualisation tools in order to keep up with these new netCDF features.

Nevertheless, the logic behind this grouping is kept in the definition of the products and the rest of this section will follow this hierarchy for the format specification.

Before entering the details of the Product Format Definition please bear in mind that:

- Only signed types are used unless strictly required otherwise.
- The long-name has been kept from the field description in [PROD-FMT]

3.2.1 Time and Orbit Group

Time and Orbit Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
1.	time_20_ku(time_20_ku) *time in TAI: seconds since 1 Jan 2000*	s	time	Data Record Time (MDSR Time Stamp)
2.	uso_cor_20_ku(time_20_ku) *uso correction applied to window delay (2-way)*			USO correction factor
3.	flag_instr_mode_op_20_ku(time_20_ku) *mode id – identifies the siral instrument measurement mode*	FLAG		Mode ID – ID 1
4.	flag_instr_mode_att_ctrl_20_ku(time_20_ku) *mode id: Platform Attitude Control*	FLAG		Mode ID – ID 5
5.	flag_instr_mode_flags_20_ku(time_20_ku) *mode id – identifies the sarin degraded case and the CAL4 flag*	FLAG		Mode ID – ID 2, ID 4
6.	seq_count_20_ku(time_20_ku) *Source Sequence Counter*	count		Source Sequence Counter
7.	flag_instr_conf_rx_in_use_20_ku(time_20_ku) *instrument configuration rx chain in use*	FLAG		Instrument Configuration
8.	flag_instr_conf_rx_bwdt_20_ku(time_20_ku) *instrument configuration: acquisition band*	FLAG		Instrument Configuration
9.	flag_instr_conf_rx_trk_mode_20_ku(time_20_ku) *instrument configuration : tracking mode*	FLAG		Instrument Configuration

Time and Orbit Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
10.	flag_instr_conf_rx_str_in_use_20_ku(time_20_ku) *instrument configuration: str in use*	FLAG		Instrument Configuration
11.	flag_instr_conf_rx_flags_20_ku(time_20_ku) *instrument configuration flags*	FLAG		Instrument Configuration
12.	rec_count_20_ku(time_20_ku) *record counter*	count		Burst counter
13.	lat_20_ku(time_20_ku) *20 Hz latitude*	deg_north	latitude	Latitude of measurement
14.	lon_20_ku(time_20_ku) *20 Hz longitude*	deg_east	longitude	Longitude of measurement
15.	alt_20_ku(time_20_ku) *altitude of the Satellite CoM above reference ellipsoid.*	M	height_above_reference_ellipsoid	Altitude of CoG above reference ellipsoid
16.	orb_alt_rate_20_ku(time_20_ku) *Altitude rate of the Satellite CoM with respect to the reference ellipsoid*	m/s		Instantaneous altitude rate derived from orbit Satellite velocity vector
17.	sat_vel_vec_20_ku(time_20_ku,space_3d) *velocity vector in itrf*	m/s		Satellite velocity vector[3] (in ITRF)

Time and Orbit Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
18.	beam_dir_vec_20_ku(time_20_ku,space_3d) *real beam direction vector in CRF*	m		Real beam direction vector[3] (in CRF)
19.	inter_base_vec_20_ku(time_20_ku,space_3d) *interferometric baseline direction vector in CRF*	m		Interferometer baseline vector[3] (in CRF)
20.	off_nadir_roll_angle_str_20_ku (time_20_ku) *antenna bench roll angle*	deg		Antenna Bench Roll Angle
21.	off_nadir_pitch_angle_str_20_ku (time_20_ku) *antenna bench pitch angle*	deg		Antenna Bench Pitch Angle
22.	off_nadir_yaw_angle_str_20_ku(time_20_ku) *antenna bench yaw angle*	deg		Antenna Bench Yaw Angle
23.	flag_mcd_20_ku (time_20_ku) *measurement confidence flags*	FLAG		Level 1b Measurement Confidence Data (flag word)
24.	ind_first_meas_20hz_01(time_cor_01) *index of the first 20Hz measurement: 1 Hz*	count		

Time and Orbit Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**unit s**	**Standard_name**	**EE Field**
25.	ind_meas_1hz_20_ku(time_20_ku) *index of the 1Hz measurement: 20 Hz ku band*	count		

3.2.2 Measurements Group

Measurements Group				
ID	**Variable Name (dim1,…,dim N)** *long_name*	**units**	**Standard_name**	**EE Field**
1.	window_del_20_ku(time_20_ku) *calibrated window delay (2way)*	s		Window Delay (2way) corrected for instrument delays
2.	h0_applied_20_ku(time_20_ku) *h0 initial height word*	s		H0 Initial Height Word
3.	cor2_applied_20_ku(time_20_ku) *cor2 height rate*	s		COR2 Height Rate
4.	h0_lai_word_20_ku(time_20_ku) *coarse range word lai*	s		Coarse Range word LAI
5.	h0_fai_word_20_ku(time_20_ku) *fine word fai*	s		Fine Range word FAI
6.	agc_ch1_20_ku(time_20_ku) *agc gain applied on rx channel 1. Gain calibration corrections are applied*	dB		AGC Channel 1 (corrected)
7.	agc_ch2_20_ku(time_20_ku) *agc gain applied on rx channel 2. Gain calibration corrections are applied*	dB		AGC Channel 2 (corrected)
8.	tot_gain_ch1_20_ku(time_20_ku) *total fixed gain on channel 1*	dB		Total Fixed Gain Rx 1
9.	tot_gain_ch2_20_ku(time_20_ku) *total fixed gain on channel 2*	dB		Total Fixed Gain Rx 2
10.	transmit_pwr_20_ku(time_20_ku) *transmitted power*	Watt		Transmit Power

Measurements Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
11.	dop_cor_20_ku(time_20_ku) *doppler range correction*	m		Doppler range correction (Radial component)
12.	instr_cor_range_tx_rx_20_ku(time_20_ku) *1-way instrument range correction (tx-rx chain)*	m		Instrument Range Correction tx-rx antenna
13.	instr_cor_range_rx_20_ku(time_20_ku) *1-way instrument range correction (rx only chain)*	m		Instrument Range Correction rx only antenna
14.	instr_cor_gain_tx_rx_20_ku(time_20_ku) *instrument gain correction (tx-rx chain)*	dB		Instrument Gain Correction tx-rx antenna
15.	instr_cor_gain_rx_20_ku(time_20_ku) *instrument gain correction (rx only chain)*	dB		Instrument Gain Correction rx only antenna
16.	instr_int_ph_cor_20_ku(time_20_ku) *internal phase correction computed from the cal-4* *(FillValue in LRM and SAR cases)*	rad		Internal Phase Correction
17.	instr_ext_ph_cor_20_ku(time_20_ku) *external phase correction taken from the ipfdb file* *(FillValue in LRM and SAR cases)*	rad		External Phase Correction
18.	noise_power_20_ku(time_20_ku) *noise power measurement*	dB		Noise power measurement

Measurements Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
19.	ph_slope_cor_20_ku(time_20_ku) *phase slope correction* *(FillValue in LRM and SAR cases)*	rad		Phase Slope Correction

3.2.3 Waveforms Group

Waveform group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
26.	doppler_angle_ku(time_20_ku,nlooks_ku)	rad	time	
27.	doppler_range_correction_ku(time_20_ku,nlooks_ku)	m		
28.	iq_scale_factor_ch1_ku(time_20_ku,nlooks_ku)	V		
29.	iq_scale_factor_ch2_ku(time_20_ku,nlooks_ku)	V		
30.	look_angle_ku(time_20_ku,nlooks_ku)	rad		
31.	sl_waveform_ch1_i_ku(time_20_ku, nlooks_ku,ns_20_ku)	count		
32.	sl_waveform_ch1_q_ku(time_20_ku, nlooks_ku,ns_20_ku)	count		
33.	sl_waveform_ch2_i_ku(time_20_ku, nlooks_ku,ns_20_ku)	count		
34.	sl_waveform_ch2_q_ku(time_20_ku, nlooks_ku,ns_20_ku)	count		
35.	sl_time_ku(time_20_ku,nlooks_ku)	s		

Waveform group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
36.	pointing_angle_ku(time_20_ku,nlooks_ku)	rad		
37.	slant_range_correction_ku(time_20_ku,nlooks_ku)	m		
38.	sl_counter_ku(time_20_ku,nlooks_ku)	count		

3.3 FBR PRODUCT SPECIFICATION – LIST OF VARIABLES

The contents of the CryoSat FBR products can be logically grouped in:

1. Time and Orbit Information
2. Measurements
3. External Corrections
4. Waveforms

This logical classification could be implemented in the netCDF 4.0 model by means of a specific structure called **group**, however this feature is not used in the CryoSat products in order to assure the back compatibility with previous versions of the netCDF models.

Nevertheless the logic behind this grouping is kept in the definition of the products and the remaining of this section will follow this hierarchy for the format specification.

Note: all the FBR variables are written in lowercase and have the suffix ***_x*** where ***_x*** indicates the frequency and it is set to ***21*** for SARIn (01 for corrections) and ***85*** for SAR (04 for corrections).

3.3.1 Time and Orbit Group

Time and Orbit Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
1.	time_x_ku(time_x_ku) *time in TAI: seconds since 1 Jan 2000*	s		Data Record Time (MDSR Time Stamp)
2.	uso_cor_x_ku(time_x_ku) *uso correction (2-way)*			USO correction factor
3.	flag_instr_mode_op_x_ku(time_x_ku) *mode id – identifies the siral instrument measurement mode*	FLAG		Mode ID – ID 1
4.	flag_instr_mode_att_ctr_x_ku(time_x_ku) *mode id – platform attitude control*	FLAG		Mode ID – ID 5
5.	flag_instr_mode_flags_x_ku(time_x_ku) *mode id – identifies the sarin degraded case and the CAL4 flag*	FLAG		Mode ID – ID 2, ID 4
	seq_count_x_ku(time_x_ku) *Source Sequence Counter*	count		Source Sequence Counter
6.	flag_instr_conf_rx_in_use_x_ku (time_x_ku) *instrument configuration flags*	FLAG		Instrument Configuration
7.	flag_instr_conf_rx_bwdt_x_ku (time_x_ku) *instrument configuration: tracking bandwidth*	FLAG		Instrument Configuration
8.	flag_instr_conf_rx_trk_mode_x_ku (time_x_ku) *instrument configuration : tracking mode*	FLAG		Instrument Configuration

Time and Orbit Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
9.	flag_instr_conf_rx_str_in_use_x_ku(time_x_ku) *instrument configuration:str in use*	FLAG		Instrument Configuration
10.	flag_instr_conf_rx_flags_x_ku(time_x_ku) *instrument configuration flags*	FLAG		Instrument Configuration
11.	rec_count_x_ku (ns_x_ku) *record counter*	count		Burst counter
12.	lat_x_ku (time_x_ku) *20 Hz latitude*	deg	latitude	Latitude of measurement
13.	lon_x_ku (time_x_ku) *20 Hz longitude*	deg	longitude	Longitude of measurement
14.	alt_x_ku (time_x_ku) *Altitude of the Satellite CoM above reference ellipsoid*	m	height_above_reference_ellipsoid	Altitude of CoM above reference ellipsoid
15.	orb_alt_rate_x_ku (time_x_ku) *Altitude rate of the Satellite CoM with respect to the reference ellipsoid*	m/s		Instantaneous altitude rate derived from orbit Satellite velocity vector
16.	sat_vel_vec_x_ku(time_x_ku,space_3d) *velocity vector in itrf*	m/s		Satellite velocity vector[3] (in ITRF)
17.	beam_dir_vec_20_x_ku(time_x_ku,space_3d) *real beam direction vector in CRF*	m		Real beam direction vector[3] (in CRF)

Time and Orbit Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
18.	inter_base_vec_x_ku(time_x_ku,space_3d) *interferometric baseline direction vector in CRF*	m		Interferometer baseline vector[3] (in CRF)
19.	flag_mcd_x_ku(time_x_ku) *measurement confidence flags*	FLAG		FBR Measurement Confidence Data (flag word)

3.3.2 Measurements Group

Measurements Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
1.	window_del_x_ku(time_x_ku) *window delay (2-way)*	s		Window Delay (2way) corrected for instrument delays
2.	h0_applied_x_ku (time_x_ku) *h0 initial height word*	s		H0 Initial Height Word
3.	cor2_applied_x_ku (time_x_ku) *cor2 height rate*	s		COR2 Height Rate
4.	h0_lai_word_x_ku (time_x_ku) *coarse range word lai*	s		Coarse Range word LAI
5.	h0_fai_word_x_ku (time_x_ku) *fine word fai*	s		Fine Range word FAI
6.	agc_1_x_ku (time_x_ku) `uncorrected agc command value for stage 1`	dB		AGC Channel 1 (corrected)
7.	agc_2_x_ku (time_x_ku) `uncorrected agc command value for stage 2`	dB		AGC Channel 2 (corrected)
8.	tot_gain_ch1_x_ku (time_x_ku) *total fixed gain on channel 1*	dB		Total Fixed Gain Rx 1
9.	tot_gain_ch2_x_ku (time_x_ku) *total fixed gain on channel 2*	dB		Total Fixed Gain Rx 2
10.	transmit_pwr_x_ku (time_x_ku) *transmitted power*	Watt		Transmit Power

Measurements Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
11.	dop_cor_x_ku (time_x_ku) *doppler range correction*	m		Doppler range correction (Radial component)
12.	instr_cor_range_tx_rx_x_ku(time_x_ku) *1-way instrument range correction (tx-rx chain)*	m		Instrument Range Correction tx-rx antenna
13.	instr_cor_range_rx_x_ku (time_x_ku) *1-way instrument range correction (rx only chain)*	m		Instrument Range Correction rx only antenna
14.	instr_cor_gain_tx_rx_x_ku (time_x_ku) *instrument gain correction (tx-rx chain)*	dB		Instrument Gain Correction tx-rx antenna
15.	instr_cor_gain_rx_x_ku (time_x_ku) *instrument gain correction (rx only chain)*	dB		Instrument Gain Correction rx only antenna
16.	instr_int_ph_cor_x_ku (time_x_ku) *internal phase correction computed from the cal-4* *(FillValue in SAR case)*	rad		Internal Phase Correction
17.	instr_ext_ph_cor_x_ku(time_x_ku) *external phase correction taken from the ipfdb file* *(FillValue in SAR case)*	rad		External Phase Correction
18.	noise_power_x_ku(time_x_ku) *noise power measurement*	dB		Noise power measurement

Measurements Group				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
19.	ph_slope_cor_x_ku(time_x_ku) *phase slope correction* *(FillValue in SAR case)*	rad		Phase Slope Correction

3.3.3 External Corrections Group

Corrections Group				
ID	**Variable Name(dim1,..,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
1.	time_cor_01(time_cor_01) *time in TAI: seconds since 1 Jan 2000*	s	time	Data Record Time (MDSR Time Stamp)
2.	mod_dry_tropo_cor_01(time_cor_01) *dry tropospheric correction (1-way)*	m	altimeter_range_correction_due_to_dry_troposphere	Dry Tropospheric Correction
3.	mod_wet_tropo_cor_01(time_cor_01) *wet tropospheric correction (1-way)*	m	altimeter_range_correction_due_to_wet_troposphere	Wet Tropospheric Correction
4.	inv_bar_cor_01(time_cor_01) *inverse barometric correction (1-way)*	m		Inverse Barometric Correction
5.	hf_fluct_total_cor_01(time_cor_01) *1-way dynamic atmospheric correction*	m		Dynamic Atmospheric Correction
6.	iono_cor_gim_01_ku(time_cor_01) *gim ionospheric correction (1-way)*	m	altimeter_range_correction_due_to_ionosphere	GIM Ionospheric Correction
7.	iono_cor_01_ku(time_cor_01) *model ionospheric correction (1-way)*	m	altimeter_range_correction_due_to_ionosphere	Model Ionospheric Correction
8.	ocean_tide_01(time_cor_01) *elastic ocean tide (1-way)*	m		Elastic Ocean Tide
9.	ocean_tide_eq_01(time_cor_01) *long period ocean tide (1-way)*	m		Long Period Ocean Tide

Corrections Group				
ID	**Variable Name(dim1,..,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
10.	load_tide_01(time_cor_01) *ocean loading tide (1-way)*	m		Ocean Loading Tide
11.	solid_earth_tide_01(time_cor_01) *solid earth tide (1-way)*	m		Solid Earth Tide
12.	pole_tide_01(time_cor_01) *geocentric polar tide (1-way)*	m		Geocentric Polar Tide
13.	surf_type_01(time_cor_01) *surface type: 1 Hz*	count		Surface type flag
14.	flag_cor_status_01(time_cor_01) *correction status flags*	m		Correction status flags
15.	flag_cor_err_01(time_cor_01) *correction error flags*	m		Correction error flags

3.3.4 Waveforms Group

Waveform group – SAR case				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
1.	cplx_waveform_ch1_i_85_ku(time_85_ku ,np_ku,ns_ku) *fbr sar complex waveforms i samples*	count		Complex Echo Waveform [64,128]
2.	cplx_waveform_ch1_q_85_ku(time_85_ku, np_ku,ns_ku) *fbr sar complex waveforms q samples*	count		Complex Echo Waveform [64,128]
3.	echo_numval_85_ku(time_85_ku) *number of echoes in a burst*	count		Number of pulses in burst
4.	flag_echo_85_ku(time_85_ku) *flags for errors or information about FBR 20Hz power waveform*	FLAG		Flags

Waveform group – SARIn case				
ID	**Variable Name (dim1,…,dim N)** ***long_name***	**units**	**Standard_name**	**EE Field**
5.	cplx_waveform_ch1_i_21_ku(time_21_ku,np_ku,ns_ku) *fbr sarin rx1 complex waveforms i samples*	count		Complex Echo Waveform [64,128] antenna 1 (Tx-Rx)
6.	cplx_waveform_ch1_q_21_ku(time_21_ku,np_ku,ns_ku) *fbr sarin rx1 complex waveforms q samples*	count		Complex Echo Waveform [64,128] antenna 1 (Tx-Rx)
7.	cplx_waveform_ch2_i_21_ku(time_21_ku,np_ku,ns_ku) *fbr sarin rx2 complex waveforms i samples*	count		Complex Echo Waveform [64,128] antenna 2 (Rx only)
8.	cplx_waveform_ch2_q_21_ku(time_21_ku,np_ku,ns_ku) *fbr sarin rx2 complex waveforms q samples*	count		Complex Echo Waveform [64,128] antenna 2 (Rx only)
9.	echo_numval_21_ku(time_21_ku) *number of echoes in a burst*	count		Number of pulses in burst
10.	flag_echo 21_ku(time_21_ku) *flags for errors or information about fbr complex waveforms*	FLAG		Flags

3.4 L1B / FBR PRODUCT SPECIFICATION – CDL DUMP

agc_1_21_ku(time_21_ku)

```
int agc_1_21_ku(time_21_ku) ;
    agc_1_21_ku :_FillValue = -2147483648 ;
    agc_1_21_ku :units = « dB » ;
    agc_1_21_ku:long_name = "uncorrected AGC command value for stage 1" ;
    agc_1_21_ku:comment = "Gain command for the AGC stage 1 for both the Rx
                          channels. It does not include the
                          calibration corrections that are specific
                          for each Rx channel" ;
    agc_1_21_ku:coordinates = "lon_21_ku lat_21_ku";
    agc_1_21_ku:add_offset = 0.0 ;
    agc_1_21_ku:scale_factor = 0.01 ;
```

agc_1_85_ku(time_85_ku)

```
int agc_1_85_ku(time_85_ku) ;
    agc_1_85_ku :_FillValue = -2147483648 ;
    agc_1_85_ku :units = « dB » ;
    agc_1_85_ku:long_name = "uncorrected AGC command value for stage 1" ;
    agc_1_85_ku:comment = "Gain command for the AGC stage 1 for both the Rx
                          channels. It does not include the
                          calibration corrections that are specific
                          for each Rx channel." ;
    agc_1_85_ku:coordinates = "lon_85_ku lat_85_ku";
    agc_1_85_ku:add_offset = 0.0 ;
    agc_1_85_ku:scale_factor = 0.01 ;
```

agc_2_21_ku(time_21_ku)

```
int agc_2_21_ku(time_21_ku) ;
    agc_2_21_ku :_FillValue = -2147483648 ;
    agc_2_21_ku :units = « dB » ;
    agc_2_21_ku:long_name = "uncorrected AGC command value for stage 2" ;
    agc_2_21_ku:comment = "Gain command for the AGC stage 2 for both the Rx
                           channels. It does not include the
                           calibration corrections that are specific
                           for each Rx channel." ;
    agc_2_21_ku:coordinates = "lon_21_ku lat_21_ku";
    agc_2_21_ku:add_offset = 0.0 ;
    agc_2_21_ku:scale_factor = 0.01 ;
```

agc_2_85_ku(time_85_ku)

```
int agc_2_85_ku(time_85_ku) ;
    agc_2_85_ku :_FillValue = -2147483648 ;
    agc_2_85_ku :units = « dB » ;
    agc_2_85_ku:long_name = "uncorrected AGC command value for stage 2" ;
    agc_2_85_ku:comment = "Gain command for the AGC stage 2 for both the Rx
                           channels. It does not include the
                           calibration corrections that are specific
                           for each Rx channel." ;
    agc_2_85_ku:coordinates = "lon_85_ku lat_85_ku";
    agc_2_85_ku:add_offset = 0.0 ;
    agc_2_85_ku:scale_factor = 0.01 ;
```

agc_ch1_20_ku(time_20_ku)

```
int agc_ch1_20_ku(time_20_ku) ;
    agc_ch1_20_ku:_FillValue = -2147483648;
    agc_ch1_20_ku:units = "dB" ;
    agc_ch1_20_ku:long_name = "AGC gain applied on rx channel 1. Gain
                               calibration corrections are applied" ;
    agc_ch1_20_ku:comment = "Calibrated AGC gain applied on Rx channel 1.
                             This is the sum of AGC stages 1 and 2
                             plus the corresponding AGC calibration
                             corrections" ;
    agc_ch1_20_ku:coordinates = "lon_20_ku lat_20_ku";
    agc_ch1_20_ku:add_offset = 0.0 ;
    agc_ch1_20_ku:scale_factor = 0.01 ;
```

agc_ch2_20_ku(time_20_ku)

```
int agc_ch2_20_ku(time_20_ku) ;
    agc_ch2_20_ku:_FillValue = -2147483648 ;
    agc_ch2_20_ku:units = "dB" ;
    agc_ch2_20_ku:long_name = "AGC gain applied on rx channel 2. Gain
                              calibration corrections are applied" ;
agc_ch2_20_ku:comment = " Calibrated AGC gain applied on Rx channel 2. This
is the sum of AGC stages 1 and 2 plus the corresponding AGC calibration
corrections" ;
    agc_ch2_20_ku:coordinates = "lon_20_ku lat_20_ku";
    agc_ch2_20_ku:add_offset = 0.0 ;
    agc_ch2_20_ku:scale_factor = 0.01 ;
```

alt_20_ku(time_20_ku)

```
int alt_20_ku(time_20_ku) ;
    alt_20_ku:_FillValue = -2147483648 ;
    alt_20_ku:units = „m" ;
    alt_20_ku:long_name = "Altitude of CoM above the reference ellipsoid" ;
    alt_20_ku:standard_name = "height_above_reference_ellipsoid" ;
    alt_20_ku:comment = "Altitude of the Satellite CoM above the reference
                          ellipsoid." ;
    alt_20_ku:coordinates = "lon_20_ku lat_20_ku";
    alt_20_ku:add_offset = 0.0 ;
    alt_20_ku:scale_factor = 0.001 ;
```

alt_21_ku(time_21_ku)

```
int alt_21_ku(time_21_ku) ;
    alt_21_ku:_FillValue = -2147483648 ;
    alt_21_ku:units = „m" ;
    alt_21_ku:long_name = " Altitude of the Satellite CoM above the
reference ellipsoid" ;
    alt_21_ku:standard_name = "height_above_reference_ellipsoid" ;
    alt_21_ku:comment = "Altitude of the Satellite CoM above the reference
                          ellipsoid [WGS84] corresponding to the MDSR Time
                          Stamp - FBR SARIn." ;
    alt_21_ku:coordinates = "lon_21_ku lat_21_ku";
    alt_21_ku:add_offset = 0. ;
    alt_21_ku:scale_factor = 0.001 ;
```

alt_85_ku(time_85_ku)

```
int alt_85_ku(time_85_ku) ;
    alt_85_ku:_FillValue = -2147483648 ;
    alt_85_ku:units = „m" ;
    alt_85_ku:long_name = " Altitude of the Satellite CoM above the
reference ellipsoid" ;
    alt_85_ku:standard_name = "height_above_reference_ellipsoid" ;
```

```
alt_85_ku:comment = "Altitude of the Satellite CoM above reference
                     ellipsoid [WGS84] corresponding to the MDSR Time
                     Stamp - FBR SAR." ;
alt_85_ku:coordinates = "lon_85_ku lat_85_ku";
alt_85_ku:add_offset = 0.0 ;
alt_85_ku:scale_factor = 0.001 ;
```

alt_avg_01_ku(time_avg_01_ku)

```
int alt_avg_01_ku(time_avg_01_ku) ;
    alt_avg_01_ku:_FillValue = -2147483648 ;
    alt_avg_01_ku:units = „m" ;
    alt_avg_01_ku:long_name = "Altitude of the Satellite CoM above
                               reference ellipsoid" ;
    alt_avg_01_ku:comment = "Altitude of the Satellite CoM above reference
ellipsoid [WGS84] corresponding to the MDSR Time Stamp for L1B 1Hz average
power waveform." ;
    alt_avg_01_ku:coordinates = "lon_avg_01_ku lat_avg_01_ku";
    alt_avg_01_ku:add_offset = 0.0 ;
    alt_avg_01_ku:scale_factor = 0.001 ;
```

alt_plrm_01_ku(time_plrm_01_ku)

```
int alt_plrm_01_ku(time_plrm_01_ku) ;
    alt_plrm_01_ku:_FillValue = -2147483648 ;
    alt_plrm_01_ku:units = „m" ;
    alt_plrm_01_ku:long_name = "Altitude of the Satellite CoM above
                                reference ellipsoid" ;
    alt_plrm_01_ku:comment = "Altitude of the Satellite CoM above reference
ellipsoid [WGS84] corresponding to the MDSR Time Stamp for L1B 1Hz average
power waveform." ;
    alt_plrm_01_ku:coordinates = "lon_plrm_01_ku lat_plrm_01_ku";
    alt_plrm_01_ku:add_offset = 0.0 ;
    alt_plrm_01_ku:scale_factor = 0.001 ;
```

alt_plrm_20_ku(time_plrm_20_ku)

```
int alt_plrm_20_ku(time_plrm_20_ku) ;
    alt_plrm_20_ku:_FillValue = -2147483648 ;
    alt_plrm_20_ku:units = „m" ;
    alt_plrm_20_ku:long_name = "Altitude of the Satellite CoM above
                              reference ellipsoid" ;
    alt_plrm_20_ku:comment = "Altitude of the Satellite CoM above reference
ellipsoid [WGS84] corresponding to the MDSR Time Stamp for L1B 1Hz average
power waveform." ;
    alt_plrm_20_ku:coordinates = "lon_plrm_20_ku lat_plrm_20_ku";
    alt_plrm_20_ku:add_offset = 0.0 ;
    alt_plrm_20_ku:scale_factor = 0.001 ;
```

beam_dir_vec_20_ku(time_20_ku,space_3d)

```
int  beam_dir_vec_20_ku(time_20_ku, space_3d) ;
    beam_dir_vec_20_ku:_FillValue = -2147483648 ;
    beam_dir_vec_20_ku:units = „m" ;
    beam_dir_vec_20_ku:long_name = "real beam direction vector in CRF" ;
    beam_dir_vec_20_ku:comment = "Real beam direction vector described in
                          the CryoSat Reference Frame. The 3 components are
                          given according to the 'space_3d' dimension: [1]
                          x, [2] y, [3] z." ;
    beam_dir_vec_20_ku:coordinates = "lon_20_ku lat_20_ku";
    beam_dir_vec_20_ku:add_offset = 0.0 ;
    beam_dir_vec_20_ku:scale_factor = 1.e-06 ;
```

beam_dir_vec_21_ku(time_21_ku,space_3d)

```
int  beam_dir_vec_21_ku(time_21_ku, space_3d) ;
    beam_dir_vec_21_ku:_FillValue = -2147483648 ;
    beam_dir_vec_21_ku:units = „m" ;
    beam_dir_vec_21_ku:long_name = "real beam direction vector in CRF" ;
    beam_dir_vec_21_ku:comment = "Real beam direction vector described in
                      the CryoSat Reference Frame. The 3 components are
                      given according to the 'space_3d' dimension: [1]
                      x, [2] y, [3] z - FBR SARIn Mode." ;
    beam_dir_vec_21_ku:coordinates = "lon_21_ku lat_21_ku";
    beam_dir_vec_21_ku:add_offset = 0.0 ;
    beam_dir_vec_21_ku:scale_factor = 1.e-06 ;
```

beam_dir_vec_85_ku(time_85_ku,space_3d)

```
int  beam_dir_vec_85_ku(time_85_ku, space_3d) ;
    beam_dir_vec_85_ku:_FillValue = -2147483648 ;
    beam_dir_vec_85_ku:units = „m" ;
    beam_dir_vec_85_ku:long_name = "real beam direction vector in CRF" ;
    beam_dir_vec_85_ku:comment = "Real beam direction vector described in
                      the CryoSat Reference Frame. The 3 components are
                      given according to the 'space_3d' dimension: [1]
                      x, [2] y, [3] z - FBR SAR Mode." ;
    beam_dir_vec_85_ku:coordinates = "lon_85_ku lat_85_ku";
    beam_dir_vec_85_ku:add_offset = 0.0 ;
    beam_dir_vec_85_ku:scale_factor = 1.e-06 ;
```

coherence_waveform_20_ku(time_20_ku, ns_20_ku)

```
short coherence_waveform_20_ku(time_20_ku, ns_20_ku) ;
    coherence_waveform_20_ku:_FillValue = -32768s ;
    coherence_waveform_20_ku:units = "count" ;
    coherence_waveform_20_ku:long_name = "l1b coherence waveform" ;
    coherence_waveform_20_ku:comment = "The L1b 20Hz coherence waveform is
                    a fully-calibrated, high resolution, multilooked
                    coherence computed from the complex echoes on the
                    two receiving channels (SARIn only)." ;
    coherence_waveform_20_ku:coordinates = "lon_20_ku lat_20_ku";
    coherence_waveform_20_ku:add_offset = 0.0 ;
    coherence_waveform_20_ku:scale_factor = 0.001 ;
```

cor2_applied_20_ku(time_20_ku)

```
int cor2_applied_20_ku(time_20_ku) ;
    cor2_applied_20_ku:_FillValue = -2147483648 ;
    cor2_applied_20_ku:units = "seconds/rc" ;
    cor2_applied_20_ku:long_name = "cor2 height rate" ;
    cor2_applied_20_ku:comment = "COR2 is the 2-way on-board tracker height
                    rate over the radar cycle, forwarded from
                    telemetry." ;
    cor2_applied_20_ku:coordinates = "lon_20_ku lat_20_ku";
    cor2_applied_20_ku:add_offset = 0.0 ;
    cor2_applied_20_ku:scale_factor = 3.05e-12 ;
```

cor2_applied_21_ku(time_21_ku)

```
int cor2_applied_21_ku(time_21_ku) ;
    cor2_applied_21_ku:_FillValue = -2147483648 ;
    cor2_applied_21_ku:units = "seconds/rc" ;
    cor2_applied_21_ku:long_name = "cor2 height rate" ;
    cor2_applied_21_ku:comment = "COR2 is the 2-way on-board tracker height
                    rate over the radar cycle, forwarded from telemetry
                    - FBR SARIn." ;
    cor2_applied_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

```
cor2_applied_21_ku:add_offset = 0.0 ;
cor2_applied_21_ku:scale_factor = 3.05e-12 ;
```

cor2_applied_85_ku(time_85_ku)

```
int cor2_applied_85_ku(time_85_ku) ;
    cor2_applied_85_ku:_FillValue = -2147483648 ;
    cor2_applied_85_ku:units = "seconds/rc" ;
    cor2_applied_85_ku:long_name = "cor2 height rate" ;
    cor2_applied_85_ku:comment = "COR2 is the 2-way on-board tracker height
                    rate over the radar cycle, forwarded from telemetry
                    - FBR SAR." ;
    cor2_applied_85_ku:coordinates = "lon_85_ku lat_85_ku";
    cor2_applied_85_ku:add_offset = 0.0 ;
    cor2_applied_85_ku:scale_factor = 3.05e-12 ;
```

cplx_waveform_ch1_i_21_ku(time_21_ku,np_ku,ns_ku)

```
byte cplx_waveform_ch1_i_21_ku(time_21_ku, np_ku,ns_ku) ;
    cplx_waveform_ch1_i_21_ku:units = "count" ;
    cplx_waveform_ch1_i_21_ku:long_name = "fbr sarin rx1 complex waveforms
i samples" ;
    cplx_waveform_ch1_i_21_ku:add_offset = 0b ;
    cplx_waveform_ch1_i_21_ku:scale_factor = 1b ;
    cplx_waveform_ch1_i_21_ku:comment = "The in-phase component of each
complex echo waveform in the burst received by antenna 1 (Tx-Rx). Instrument
calibrations not applied." ;
cplx_waveform_ch1_i_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

cplx_waveform_ch1_i_85_ku(time_85_ku,np_ku, ns_ku)

```
byte cplx_waveform_ch1_i_85_ku(time_85_ku, np_ku, ns_ku) ;
    cplx_waveform_ch1_i_85_ku:units = "count" ;
    cplx_waveform_ch1_i_85_ku:long_name = " fbr sar complex waveforms i
samples" ;
    cplx_waveform_ch1_i_85_ku:add_offset = 0b ;
    cplx_waveform_ch1_i_85_ku:scale_factor = 1b ;
    cplx_waveform_ch1_i_85_ku:comment = "The in-phase component of each
complex echo waveform in the burst received by antenna 1 (Tx-Rx). Instrument
calibrations not applied." ;
```

cplx_waveform_ch1_i_85_ku:coordinates = "lon_85_ku lat_85_ku";

cplx_waveform_ch1_q_21_ku(time_21_ku,np_ku, ns_ku)

byte cplx_waveform_ch1_q_21_ku(time_21_ku, np_ku, ns_ku) ;

cplx_waveform_ch1_q_21_ku:units = "count" ;

cplx_waveform_ch1_q_21_ku:long_name = "fbr sarin rx1 complex waveforms q samples" ;

cplx_waveform_ch1_q_21_ku:add_offset = 0b ;

cplx_waveform_ch1_q_21_ku:scale_factor = 1b ;

cplx_waveform_ch1_q_21_ku:comment = "The quadrature component of each complex echo waveform in the burst received by antenna 1 (Tx-Rx). Instrument calibrations not applied." ;

cplx_waveform_ch1_q_21_ku:coordinates = "lon_21_ku lat_21_ku";

cplx_waveform_ch1_q_85_ku(time_85_ku,np_ku, ns_ku)

byte cplx_waveform_ch1_q_85_ku(time_85_ku, np_ku, ns_ku) ;

cplx_waveform_ch1_q_85_ku:units = "count" ;

cplx_waveform_ch1_q_85_ku:long_name = "fbr sar complex waveforms q samples" ;

cplx_waveform_ch1_q_85_ku:add_offset = 0b ;

cplx_waveform_ch1_q_85_ku:scale_factor = 1b ;

cplx_waveform_ch1_q_85_ku:comment = "The quadrature component of each complex echo waveform in the burst received by antenna 1 (Tx-Rx). Instrument calibrations not applied." ;

cplx_waveform_ch1_q_85_ku:coordinates = "lon_85_ku lat_85_ku";

cplx_waveform_ch2_i_21_ku(time_21_ku,np_ku, ns_ku)

byte cplx_waveform_ch2_i_21_ku(time_21_ku, np_ku, ns_ku) ;

cplx_waveform_ch2_i_21_ku:units = "count" ;

cplx_waveform_ch2_i_21_ku:long_name = "fbr sarin complex waveforms i samples" ;

cplx_waveform_ch2_i_21_ku:add_offset = 0b ;

cplx_waveform_ch2_i_21_ku:scale_factor = 1b ;

cplx_waveform_ch2_i_21_ku:comment = “The in-phase component of each complex echo waveform in the burst received by antenna 2 (Rx only). Instrument calibrations not applied.” ;

cplx_waveform_ch2_i_21_ku:coordinates = “lon_21_ku lat_21_ku”;

cplx_waveform_ch2_q_21_ku(time_21_ku,np_ku, ns_ku)

```
byte cplx_waveform_ch2_q_21_ku(time_21_ku, np_ku, ns_ku) ;
    cplx_waveform_ch2_q_21_ku:units = "count" ;
    cplx_waveform_ch2_q_21_ku:long_name = "fbr sarin rx2 complex waveforms q samples" ;
    cplx_waveform_ch2_q_21_ku:add_offset = 0b ;
    cplx_waveform_ch2_q_21_ku:scale_factor = 1b ;
    cplx_waveform_ch2_q_21_ku:comment = "The quadrature component of each complex echo waveform in the burst received by antenna 2 (Rx only). Instrument calibrations not applied." ;
cplx_waveform_ch2_q_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

dop_angle_start_20_ku(time_20_ku)

```
int dop_angle_start_20_ku(time_20_ku) ;
    dop_angle_start_20_ku:_FillValue = -2147483648 ;
    dop_angle_start_20_ku:units = "rad" ;
    dop_angle_start_20_ku:long_name = "doppler angle start" ;
    dop_angle_start_20_ku:add_offset = 0.0 ;
    dop_angle_start_20_ku:scale_factor = 1.e-07 ;
    dop_angle_start_20_ku:comment = "Value of Doppler Angle for the first single look echo in the stack. It is the angle between: (a) direction perpendicular to the velocity vector, (b) direction from satellite to surface location. The Doppler angle depends on velocity vector and on geometry. SAR/SARIn only." ;
    dop_angle_start_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

dop_angle_stop_20_ku(time_20_ku)

```
int dop_angle_stop_20_ku(time_20_ku) ;
    dop_angle_stop_20_ku:_FillValue = -2147483648 ;
    dop_angle_stop_20_ku:units = "rad" ;
    dop_angle_stop_20_ku:long_name = "doppler angle stop" ;
    dop_angle_stop_20_ku:add_offset = 0.0;
    dop_angle_stop_20_ku:scale_factor = 1.e-07 ;
    dop_angle_stop_20_ku:comment = "Value of Doppler Angle for the last
                       single look echo in the stack. It is the angle
                       between: (a) direction perpendicular to the
                       velocity vector, (b) direction from satellite to
                       surface location. The Doppler angle depends on
                       velocity vector and on geometry. SAR/SARIn
                       only." ;
    dop_angle_stop_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

dop_cor_20_ku(time_20_ku)

```
int  dop_cor_20_ku(time_20_ku) ;
    dop_cor_20_ku:_FillValue = -2147483648 ;
    dop_cor_20_ku:units = "m" ;
    dop_cor_20_ku:long_name = "doppler range correction" ;
    dop_cor_20_ku:comment = "This is the Doppler range correction due to
                   the satellite altitude rate. It is computed for the
                   component of satellite velocity in the nadir
                   direction. Correction applied to L1B LRM waveforms
                   only." ;
    dop_cor_20_ku:coordinates = "lon_20_ku lat_20_ku";
    dop_cor_20_ku:add_offset = 0.0 ;
    dop_cor_20_ku:scale_factor = 0.001 ;
```

dop_cor_21_ku(time_21_ku)

```
int  dop_cor_21_ku(time_21_ku) ;
    dop_cor_21_ku:_FillValue = -2147483648 ;
    dop_cor_21_ku:units = "m" ;
    dop_cor_21_ku:long_name = "doppler range correction" ;
    dop_cor_21_ku:comment = "This is the Doppler range correction due to
                   the satellite altitude rate. It is computed for the
                   component of satellite velocity in the nadir
                   direction. Not used by the SAR processor - FBR
                   SARIn.";
    dop_cor_21_ku:coordinates = "lon_21_ku lat_21_ku";
    dop_cor_21_ku:add_offset = 0. ;
    dop_cor_21_ku:scale_factor = 0.001 ;
```

dop_cor_85_ku(time_85_ku)

```
int  dop_cor_85_ku(time_85_ku) ;
    dop_cor_85_ku:_FillValue = -2147483648 ;
    dop_cor_85_ku:units = "m" ;
    dop_cor_85_ku:long_name = "doppler range correction" ;
    dop_cor_85_ku:comment = "This is the Doppler range correction due to
                   the satellite altitude rate. It is computed for the
                   component of satellite velocity in the nadir
                   direction. Not used by the SAR processor - FBR
                   SAR.";
    dop_cor_85_ku:coordinates = "lon_85_ku lat_85_ku";
    dop_cor_85_ku:add_offset = 0. ;
    dop_cor_85_ku:scale_factor = 0.001 ;
```

echo_numval_20_ku(time_20_ku)

```
short echo_numval_20_ku(time_20_ku) ;
    echo_numval_20_ku:_FillValue = -32768s ;
    echo_numval_20_ku:units = "count" ;
    echo_numval_20_ku:long_name = "number of echoes averaged" ;
    echo_numval_20_ku:add_offset = 0s ;
    echo_numval_20_ku:scale_factor = 1s ;
    echo_numval_20_ku:comment = "For LRM this is the number of echoes
                averaged to compute the corresponding L1B 20Hz power
                waveform. For SAR/SARIn this is the number of single
                look echoes in the Surface Sample Stack that have
                been multilooked to compute the corresponding L1B
                20Hz power waveform. This variable includes only one
                receiving channel however, in SARIn, single looks
                from both channels are averaged in order to reduce
                the SNR.";
    echo_numval_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

echo_numval_21_ku(time_21_ku)

```
short echo_numval_21_ku(time_21_ku) ;
    echo_numval_21_ku:_FillValue = -32768s ;
    echo_numval_21_ku:units = "count" ;
    echo_numval_21_ku:long_name = "number of echoes in a burst" ;
    echo_numval_21_ku:add_offset = 0s ;
    echo_numval_21_ku:scale_factor = 1s ;
    echo_numval_21_ku:comment = "Number of echoes in a burst. It is
                expected to be equal to 64: if lower some of the
                echoes the corresponding burst are filled with
                zeroes." ;
    echo_numval_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

echo_numval_85_ku(time_85_ku)

```
short echo_numval_85_ku(time_85_ku) ;
    echo_numval_85_ku:_FillValue = -32768s ;
    echo_numval_85_ku:units = "count" ;
    echo_numval_85_ku:long_name = "number of echoes in a burst" ;
    echo_numval_85_ku:add_offset = 0s ;
    echo_numval_85_ku:scale_factor = 1s ;
    echo_numval_85_ku:comment = "Number of echoes in a burst. It is
                    expected to be equal to 64: if lower some of the
                    echoes the corresponding burst are filled with
                    zeroes." ;
    echo_numval_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

echo_numval_avg_01_ku(time_avg_01_ku)

```
short echo_numval_avg_01_ku(time_avg_01_ku) ;
    echo_numval_avg_01_ku:_FillValue = -32768s ;
    echo_numval_avg_01_ku:units = "count" ;
    echo_numval_avg_01_ku:long_name = "number of echoes averaged" ;
    echo_numval_avg_01_ku:add_offset = 0s ;
    echo_numval_avg_01_ku:scale_factor = 1s ;
    echo_numval_avg_01_ku:comment = "Number of echoes averaged to obtain
                    the corresponding L1B 1Hz average power
                    waveform. In SARIn it accounts for the two Rx
                    channels" ;
    echo_numval_avg_01_ku:coordinates = "lon_avg_01_ku lat_avg_01_ku";
```

echo_numval_plrm_01_ku(time_plrm_01_ku)

```
short echo_numval_plrm_01_ku(time_plrm_01_ku) ;
    echo_numval_plrm_01_ku:_FillValue = -32768s ;
    echo_numval_plrm_01_ku:units = "count" ;
    echo_numval_plrm_01_ku:long_name = "number of echoes averaged" ;
    echo_numval_plrm_01_ku:add_offset = 0s ;
    echo_numval_plrm_01_ku:scale_factor = 1s ;
```

```
        echo_numval_plrm_01_ku:comment = "Number of echoes averaged to obtain
                               the corresponding L1B 1Hz average power
                               waveform. In SARIn it accounts for the two Rx
                               channels" ;
        echo_numval_plrm_01_ku:coordinates = "lon_plrm_01_ku lat_plrm_01_ku";
```

echo_numval_plrm_20_ku(time_plrm_20_ku)

```
    short echo_numval_plrm_20_ku(time_plrm_20_ku) ;
        echo_numval_plrm_20_ku:_FillValue = -32768s ;
        echo_numval_plrm_20_ku:units = "count" ;
        echo_numval_plrm_20_ku:long_name = "number of echoes averaged" ;
        echo_numval_plrm_20_ku:add_offset = 0s ;
        echo_numval_plrm_20_ku:scale_factor = 1s ;
        echo_numval_plrm_20_ku:comment = "Number of echoes averaged to obtain
                               the corresponding L1B 1Hz average power
                               waveform. In SARIn it accounts for the two Rx
                               channels" ;
        echo_numval_plrm_20_ku:coordinates = "lon_plrm_20_ku lat_plrm_20_ku";
```

echo_scale_factor_20_ku(time_20_ku)

```
int  echo_scale_factor_20_ku(time_20_ku) ;
          echo_scale_factor_20_ku:_FillValue = -2147483648;
          echo_scale_factor_20_ku:units = "count" ;
          echo_scale_factor_20_ku:long_name = "echo scale factor (to scale
          echo to watts)" ;
          echo_scale_factor_20_ku:add_offset = 0.0 ;
          echo_scale_factor_20_ku:scale_factor = 1.e-09;
          echo_scale_factor_20_ku:comment = "The 20Hz power waveform
                    scaling factor, computed in order to best fit
                    each waveform within 2 bytes. The scaling,
                    needed to convert the L1B 1Hz average power
                    waveform into Watts, is applied as follows:
                    pwr_waveform_20_ku(time_20_ku,ns_20_ku)
                    *echo_scale_factor_20_ku(time_20_ku)*2^echo_s
                    cale_pwr_20_ku(time_20_ku)." ;
          echo_scale_factor_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

echo_scale_factor_avg_01_ku(time_avg_01_ku)

```
int echo_scale_factor_avg_01_ku(time_avg_01_ku) ;
    echo_scale_factor_avg_01_ku:_FillValue = -2147483648;
    echo_scale_factor_avg_01_ku:units = "count" ;
    echo_scale_factor_avg_01_ku:long_name = "echo scale factor (to scale
                    echo to watts)" ;
    echo_scale_factor_avg_01_ku:add_offset = 0. ;
    echo_scale_factor_avg_01_ku:scale_factor = 1.e-09 ;
    echo_scale_factor_avg_01_ku:comment = "The 1Hz average power waveform
                    scaling factor, computed in order to best fit each
                    waveform within 2 bytes. The scaling, needed to
                    convert the L1B 1Hz average power waveform into
                    Watts, is applied as follows:
                    pwr_waveform_avg_01_ku(time_avg_01_ku,ns_avg_01_ku)
                    *echo_scale_factor_avg_01_ku(time_avg_01_ku)*2^echo_
                    scale_pwr_avg_01_ku(time_avg_01_ku)." ;
    echo_scale_factor_avg_01_ku:coordinates = "lon_avg_01_ku
                    lat_avg_01_ku";
```

echo_scale_factor_plrm_01_ku(time_plrm_01_ku)

```
int echo_scale_factor_plrm_01_ku(time_plrm_01_ku) ;
    echo_scale_factor_plrm_01_ku:_FillValue = -2147483648;
    echo_scale_factor_plrm_01_ku:units = "count" ;
    echo_scale_factor_plrm_01_ku:long_name = "echo scale factor (to scale
                                    echo to watts)" ;
    echo_scale_factor_plrm_01_ku:add_offset = 0. ;
    echo_scale_factor_plrm_01_ku:scale_factor = 1.e-09 ;
    echo_scale_factor_plrm_01_ku:comment = "The 1Hz average power waveform
                    scaling factor, computed in order to best fit each
                    waveform within 2 bytes. The scaling, needed to
                    convert the L1B 1Hz average power waveform into
                    Watts, is applied as follows:
                    pwr_waveform_plrm_01_ku(time_plrm_01_ku,ns_plrm_01_k
                    u)
                    *echo_scale_factor_plrm_01_ku(time_plrm_01_ku)*2^ech
                    o_scale_pwr_plrm_01_ku(time_plrm_01_ku)." ;
    echo_scale_factor_plrm_01_ku:coordinates = "lon_plrm_01_ku
                    lat_plrm_01_ku";
```

echo_scale_factor_plrm_20_ku(time_plrm_20_ku)

```
int echo_scale_factor_plrm_20_ku(time_plrm_20_ku) ;
    echo_scale_factor_plrm_20_ku:_FillValue = -2147483648;
    echo_scale_factor_plrm_20_ku:units = "count" ;
    echo_scale_factor_plrm_20_ku:long_name = "echo scale factor (to scale
                                    echo to watts)" ;
    echo_scale_factor_plrm_20_ku:add_offset = 0. ;
    echo_scale_factor_plrm_20_ku:scale_factor = 1.e-09 ;
    echo_scale_factor_plrm_20_ku:comment = "The 20Hz average power waveform
                    scaling factor, computed in order to best fit each
                    waveform within 2 bytes. The scaling, needed to
                    convert the L1B 20Hz average power waveform into
                    Watts, is applied as follows:
                    pwr_waveform_plrm_20_ku(time_plrm_20_ku,ns_plrm_20_k
                    u)
```

```
*echo_scale_factor_plrm_20_ku(time_plrm_20_ku)*2^ech
o_scale_pwr_plrm_20_ku(time_plrm_20_ku)." ;
```

echo_scale_pwr_20_ku(time_20_ku)

```
int echo_scale_pwr_20_ku(time_20_ku) ;
    echo_scale_pwr_20_ku:_FillValue = -2147483648 ;
    echo_scale_pwr_20_ku:units = "count" ;
    echo_scale_pwr_20_ku:long_name = "echo scale power (a power of 2)" ;
    echo_scale_pwr_20_ku:add_offset = 0 ;
    echo_scale_pwr_20_ku:scale_factor = 1 ;
    echo_scale_pwr_20_ku:comment = "The 20Hz power waveform power scaling
                        factor, computed in order to best fit each
                        waveform within 2 bytes. The scaling, needed
                        to convert the L1B 1Hz average power waveform
                        into Watts, is applied as follows:
                        pwr_waveform_20_ku(time_20_ku,ns_20_ku)
                        *echo_scale_factor_20_ku(time_20_ku)*2^echo_s
                        cale_pwr_20_ku(time_20_ku)." ;
    echo_scale_pwr_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

echo_scale_pwr_avg_01_ku(time_avg_01_ku)

```
int echo_scale_pwr_avg_01_ku(time_avg_01_ku) ;
    echo_scale_pwr_avg_01_ku:_FillValue = -2147483648 ;
    echo_scale_pwr_avg_01_ku:units = "count" ;
    echo_scale_pwr_avg_01_ku:long_name = "echo scale power (a power of 2)";
    echo_scale_pwr_avg_01_ku:add_offset = 0 ;
    echo_scale_pwr_avg_01_ku:scale_factor = 1 ;
    echo_scale_pwr_avg__plrm_01_ku:comment = "The 1Hz average power
             waveform power scaling factor, computed in order to best
             fit each waveform within 2 bytes. The scaling, needed to
             convert the L1B 1Hz average power waveform into Watts, is
             applied as follows:
             pwr_waveform_avg_01_ku(time_avg_01_ku,ns_avg_01_ku)
             *echo_scale_factor_avg_01_ku(time_avg_01_ku)*2^echo_scale_p
             wr_avg_01_ku(time_avg_01_ku)." ;
    echo_scale_pwr_avg_01_ku:coordinates = "lon_avg_01_ku lat_avg_01_ku";
```

echo_scale_pwr_plrm_01_ku(time_plrm_01_ku)

```
int echo_scale_pwr_plrm_01_ku(time_plrm_01_ku) ;
    echo_scale_pwr_plrm_01_ku:_FillValue = -2147483648 ;
    echo_scale_pwr_plrm_01_ku:units = "count" ;
    echo_scale_pwr_plrm_01_ku:long_name = "echo scale power (a power of 2)";
    echo_scale_pwr_plrm_01_ku:add_offset = 0 ;
    echo_scale_pwr_plrm_01_ku:scale_factor = 1 ;
    echo_scale_pwr_plrm_01_ku:comment = "The 1Hz average power waveform
             power scaling factor, computed in order to best fit each
             waveform within 2 bytes. The scaling, needed to convert the
             L1B 1Hz average power waveform into Watts, is applied as
             follows:
             pwr_waveform_plrm_01_ku(time_plrm_01_ku,ns_plrm_01_ku)
             *echo_scale_factor_plrm_01_ku(time_plrm_01_ku)*2^echo_scale
             _pwr_plrm_01_ku(time_plrm_01_ku)." ;
    echo_scale_pwr_plrm_01_ku:coordinates = "lon_plrm_01_ku
             lat_plrm_01_ku";
```

echo_scale_pwr_plrm_20_ku(time_plrm_20_ku)

```
int echo_scale_pwr_plrm_20_ku(time_plrm_20_ku) ;
    echo_scale_pwr_plrm_20_ku:_FillValue = -2147483648 ;
    echo_scale_pwr_plrm_20_ku:units = "count" ;
    echo_scale_pwr_plrm_20_ku:long_name = "echo scale power (a power of 2)";
    echo_scale_pwr_plrm_20_ku:add_offset = 0 ;
    echo_scale_pwr_plrm_20_ku:scale_factor = 1 ;
    echo_scale_pwr_plrm_20_ku:comment = "The 20Hz average power waveform
             power scaling factor, computed in order to best fit each
             waveform within 2 bytes. The scaling, needed to convert the
             L1B 20Hz average power waveform into Watts, is applied as
             follows:
             pwr_waveform_plrm_20_ku(time_plrm_20_ku,ns_plrm_20_ku)
             *echo_scale_factor_plrm_20_ku(time_plrm_20_ku)*2^echo_scale
             _pwr_plrm_20_ku(time_plrm_20_ku)." ;
    echo_scale_pwr_plrm_20_ku:coordinates = "lon_plrm_20_ku
             lat_plrm_20_ku";
```

flag_cor_err_01(time_cor_01)

Note: refer to section 3.5 for the flag meaning definition

```
int flag_cor_err_01(time_cor_01) ;
    flag_cor_err_01:_FillValue = -1 ;
    flag_cor_err_01:long_name = "correction error flags" ;
    flag_cor_err_01:flag_masks = 2048, 1024, 512, 256, 128, 64, 32, 16, 8,
                                  4, 2, 1;
    flag_cor_err_01:flag_meanings = „model_dry_error model_wet_error
                                     inv_bar_error
                                     hf_fluctuations_error
                                     iono_gim_error
                                     iono_model_error
                                     ocean_tide_error
                                     ocean_tide_equil_error
                                     load_tide_error
                                     solid_earth_error
                                     pole_tide_error
                                     surface_type_error" ;
    flag_cor_err_01:comment = "Correction error flags. This flag shows
                               whether the correction algorithm returned
                               an error. " ;
    flag_cor_err_01:coordinates = "lat_cor_01 lon_cor_01";
```

flag_cor_status_01(time_cor_01)

Note: refer to section 3.5 for the flag meaning definition

```
int flag_cor_status_01(time_cor_01) ;
    flag_cor_status_01:_FillValue = -1 ;
    flag_cor_status_01:long_name = "correction status flags" ;
    flag_cor_status_01:flag_masks = 2048, 1024, 512, 256, 128, 64, 32, 16,
                                     8, 4, 2, 1;
    flag_cor_status_01:flag_meanings = "model_dry_called model_wet_called
                                        inv_bar_called
                                        hf_fluctuations_called
                                        iono_gim_called
```

```
                                          iono_model_called
                                          ocean_tide_called
                                          ocean_tide_equil_called
                                          load_tide_called
                                          solid_earth_called
                                          pole_tide_called
                                          surface_type_called" ;
flag_cor_status_01:comment = "Correction status flags- showing which
                          correction algorithms have been called. " ;
flag_cor_status_01:coordinates = "lat_cor_01 lon_cor_01";
```

flag_echo_20_ku(time_20_ku)

Note: refer to section 3.5 for the flag meaning definition

```
short flag_echo_20_ku(time_20_ku) ;
    flag_echo_20_ku:_FillValue = -1s;
    flag_echo_20_ku:long_name = ”flags for errors or information about L1b
                                20Hz power waveform” ;
    flag_echo_20_ku:flag_masks = -32768s, 16384s, 8192s, 4096s, 2048s,
                                 1024s, 512s, 256s;
    flag_echo_20_ku:flag_meanings = ”approx_beam_steering
                                     exact_beam_steering
                                     doppler_weighting_computed
                                     doppler_weighting_applied
                                     multi_look_incomplete
                                     beam_angle_steering_error
                                     anti_aliased_power_echoes
                                     auto_beam_steering” ;
    flag_echo_20_ku:comment = ”Flags for errors or information about
                              SAR/SARIn L1b 20Hz power waveform. SAR/SARIn
                              only.” ;
    flag_echo_20_ku:coordinates = “lon_20_ku lat_20_ku”;
```

flag_echo_21_ku(time_21_ku)

```
short flag_echo_21_ku(time_21_ku) ;
    flag_echo_21_ku:_FillValue = -1s;
    flag_echo_21_ku:long_name = ”flags for errors or information about fbr
                                complex waveforms” ;
    flag_echo_21_ku:comment = ”Flags for errors or information about FBR
                              SARIn 21Hz complex echo waveforms. Currently
                              not used. Reserved for future use” ;
    flag_echo_21_ku:coordinates = “lon_21_ku lat_21_ku”;
```

flag_echo_85_ku(time_85_ku)

```
short flag_echo_85_ku(time_85_ku) ;
    flag_echo_85_ku:_FillValue = -1s;
    flag_echo_85_ku:long_name = "flags for errors or information about  L1b
                                 20Hz power waveform" ;
    flag_echo_85_ku:comment = "Flags for errors or information about fbr
                               complex waveforms. Currently not used.
                               Reserved for future use " ;
    flag_echo_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

flag_echo_avg_01_ku(time_avg_01_ku)

Note: refer to section 3.5 for the flag meaning definition

```
short flag_echo_avg_01_ku(time_avg_01_ku) ;
    flag_echo_avg_01_ku:_FillValue = -1s;
    flag_echo_avg_01_ku:long_name = "flags for errors or information about
                                     1Hz average power waveform" ;
    flag_echo_avg_01_ku:flag_masks = -32768s, 1s;
    flag_echo_avg_01_ku:flag_meanings = "1_hz_echo_error_not_computed
                                         mispointing_bad_angles" ;
    flag_echo_avg_01_ku:comment = "Flags for errors or information about
                                   L1B 1Hz average power waveform."
                                   ;
    flag_echo_avg_01_ku:coordinates = "lon_avg_01_ku lat_avg_01_ku";
```

flag_echo_plrm_01_ku(time_plrm_01_ku)

Note: refer to section 3.5 for the flag meaning definition

```
short flag_echo_plrm_01_ku(time_plrm_01_ku) ;
    flag_echo_plrm_01_ku:_FillValue = -1s;
    flag_echo_plrm_01_ku:long_name = "flags for errors or information about
                                      1Hz plrm power waveform" ;
    flag_echo_plrm_01_ku:flag_masks = -32768s, 1s;
```

```
    flag_echo_plrm_01_ku:flag_meanings = "plrm_echo_error_not_computed
                                          mispointing_bad_angles" ;
    flag_echo_plrm_01_ku:comment = "Flags for errors or information about
                                    L1B 1Hz average power waveform."
                                    ;
    flag_echo_plrm_01_ku:coordinates = "lon_plrm_01_ku lat_plrm_01_ku";
```

flag_echo_plrm_20_ku(time_plrm_20_ku)

Note: refer to section 3.5 for the flag meaning definition

```
short flag_echo_plrm_20_ku(time_plrm_20_ku) ;
    flag_echo_plrm_20_ku:_FillValue = -1s;
    flag_echo_plrm_20_ku:long_name = "flags for errors or information about
                                      20Hz plrm power waveform" ;
    flag_echo_plrm_20_ku:flag_masks = -32768s, 1s;
    flag_echo_plrm_20_ku:flag_meanings = "plrm_echo_error_not_computed
                                          mispointing_bad_angles" ;
    flag_echo_plrm_20_ku:comment = "Flags for errors or information about
                                    L1B 20Hz average power
                                    waveform." ;
    flag_echo_plrm_20_ku:coordinates = "lon_plrm_20_ku lat_plrm_20_ku";
```

flag_instr_conf_rx_bwdt_20_ku(time_20_ku)

```
byte flag_instr_conf_rx_bwdt_20_ku(time_20_ku) ;
    flag_instr_conf_rx_bwdt_20_ku:_FillValue = -128b;
    flag_instr_conf_rx_bwdt_20_ku:long_name = „instrument configuration:
                                              acquisition band‟ ;
    flag_instr_conf_rx_bwdt_20_ku:flag_values = 0b, 1b, 2b ;
    flag_instr_conf_rx_bwdt_20_ku:flag_meanings = "unknown 320_mhz 40_mhz"
;
    flag_instr_conf_rx_bwdt_20_ku:comment = "This flag contains the
                                  acquisition band of the SIRAL instrument." ;
    flag_instr_conf_rx_bwdt_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

flag_instr_conf_rx_bwdt_21_ku(time_21_ku)

```
byte flag_instr_conf_rx_bwdt_21_ku(time_21_ku) ;
    flag_instr_conf_rx_bwdt_21_ku:_FillValue = -128b;
    flag_instr_conf_rx_bwdt_21_ku:long_name = "instrument configuration :
                                              tracking bandwidth" ;
    flag_instr_conf_rx_bwdt_21_ku:flag_values = 0b, 1b, 2b ;
    flag_instr_conf_rx_bwdt_21_ku:flag_meanings = "unknown 320_mhz 40_mhz"
;
    flag_instr_conf_rx_bwdt_21_ku:comment = "This flag contains the
                                  tracking bandwidth of the SIRAL instrument -
                                  FBR SARIn." ;
    flag_instr_conf_rx_bwdt_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

flag_instr_conf_rx_bwdt_85_ku(time_85_ku)

```
byte flag_instr_conf_rx_bwdt_85_ku(time_85_ku) ;
    flag_instr_conf_rx_bwdt_85_ku:_FillValue = -128b;
    flag_instr_conf_rx_bwdt_85_ku:long_name = "instrument configuration:
                                              tracking bandwidth" ;
    flag_instr_conf_rx_bwdt_85_ku:flag_values = 0b, 1b, 2b ;
    flag_instr_conf_rx_bwdt_85_ku:flag_meanings = "unknown 320_mhz 40_mhz"
;
```

```
flag_instr_conf_rx_bwdt_85_ku:comment = "This flag contains the
        tracking bandwidth of the SIRAL instrument -
        FBR SAR." ;
flag_instr_conf_rx_bwdt_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

flag_instr_conf_rx_flags_20_ku(time_20_ku)

Note: refer to section 3.5 for the flag meaning definition

```
byte flag_instr_conf_rx_flags_20_ku(time_20_ku) ;
    flag_instr_conf_rx_flags_20_ku:long_name = "instrument configuration
        flags" ;
    flag_instr_conf_rx_flags_20_ku:flag_masks = -128b, 64b, 32b, 16b, 8b,
        4b, 2b, 1b ;
    flag_instr_conf_rx_flags_20_ku:flag_meanings = "siral_redundant
        external_cal open_loop
        loss_of_echo real_time_error
        echo_saturation
        rx_band_attenuated
        cycle_report_error" ;
    flag_instr_conf_rx_flags_20_ku:comment = "This flag contains the status
        of the SIRAL instrument acquisition." ;
    flag_instr_conf_rx_flags_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

flag_instr_conf_rx_flags_21_ku(time_21_ku)

```
byte flag_instr_conf_rx_flags_21_ku(time_21_ku) ;
    flag_instr_conf_rx_flags_21_ku:long_name = "instrument configuration
        flags" ;
    flag_instr_conf_rx_flags_21_ku:flag_masks = -128b, 64b, 32b, 16b, 8b,
        4b, 2b, 1b ;
    flag_instr_conf_rx_flags_21_ku:flag_meanings = "siral_redundant
        external_cal open_loop
        loss_of_echo real_time_error
        echo_saturation
        rx_band_attenuated
        cycle_report_error" ;
```

```
flag_instr_conf_rx_flags_21_ku:comment = ”This flag contains the status
                                of the SIRAL instrument tracking - FBR
                                SARIn.” ;
flag_instr_conf_rx_flags_21_ku:coordinates = “lon_21_ku lat_21_ku”;
```

flag_instr_conf_rx_flags_85_ku(time_85_ku)

```
byte flag_instr_conf_rx_flags_85_ku(time_85_ku) ;
    flag_instr_conf_rx_flags_85_ku:long_name = ”instrument configuration
                                               flags” ;
    flag_instr_conf_rx_flags_85_ku:flag_masks = -128b, 64b, 32b, 16b, 8b,
                                                4b, 2b, 1b ;
    flag_instr_conf_rx_flags_85_ku:flag_meanings = “siral_redundant
                                                external_cal open_loop
                                                loss_of_echo real_time_error
                                                echo_saturation
                                                rx_band_attenuated
                                                cycle_report_error” ;
    flag_instr_conf_rx_flags_85_ku:comment = ”This flag contains the status
                                 of the SIRAL instrument tracking – FBR SAR.”
                                 ;
    flag_instr_conf_rx_flags_85_ku:coordinates = “lon_85_ku lat_85_ku”;
```

flag_instr_conf_rx_in_use_20_ku(time_20_ku)

```
byte flag_instr_conf_rx_in_use_20_ku(time_20_ku) ;
    flag_instr_conf_rx_in_use_20_ku:_FillValue = -128b ;
    flag_instr_conf_rx_in_use_20_ku:long_name = “instrument configuration :
                                                rx chain in use” ;
    flag_instr_conf_rx_in_use_20_ku:flag_values = 0b, 1b, 2b, 3b ;
    flag_instr_conf_rx_in_use_20_ku:flag_meanings = “unknown rx1 rx2 both”
;
    flag_instr_conf_rx_in_use_20_ku:comment = ”This flag contains the SIRAL
                                 instrument channel in use.” ;
    flag_instr_conf_rx_in_use_20_ku:coordinates = “lon_20_ku lat_20_ku”;
```

flag_instr_conf_rx_in_use_21_ku(time_21_ku)

```
byte  flag_instr_conf_rx_in_use_21_ku(time_20_ku) ;
      flag_instr_conf_rx_in_use_21_ku:_FillValue      = -128b ;
      flag_instr_conf_rx_in_use_21_ku:long_name       = "instrument configuration:
                                                        rx channel in use" ;
      flag_instr_conf_rx_in_use_21_ku:flag_values     = 0b, 1b, 2b, 3b ;
      flag_instr_conf_rx_in_use_21_ku:flag_meanings   = "unknown rx1 rx2 both" ;

      flag_instr_conf_rx_in_use_21_ku:comment         = "This flag contains the
                                                        SIRAL instrument channel in
                                                        use in FBR SARIn" ;
      flag_instr_conf_rx_in_use_21_ku:coordinates =
      "lon_21_ku lat_21_ku";
```

flag_instr_conf_rx_in_use_85_ku(time_85_ku)

```
byte flag_instr_conf_rx_in_use_85_ku(time_85_ku) ;
    flag_instr_conf_rx_in_use_85_ku:_FillValue = -128b;
    flag_instr_conf_rx_in_use_85_ku:long_name  =  "instrument  configuration
                                                  flags" ;
    flag_instr_conf_rx_in_use_85_ku:flag_values = 0b, 1b, 2b, 3b ;
    flag_instr_conf_rx_in_use_85_ku:flag_meanings  =  "unknown  rx1  rx2  both"
;
    flag_instr_conf_rx_in_use_85_ku:comment = "This flag contains the SIRAL
                           instrument channel in use in FBR SAR." ;
    flag_instr_conf_rx_in_use_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

flag_instr_conf_rx_str_in_use_20_ku(time_20_ku)

```
byte flag_instr_conf_rx_str_in_use_20_ku(time_20_ku) ;
    flag_instr_conf_rx_str_in_use_20_ku:_FillValue = -128b ;
    flag_instr_conf_rx_str_in_use_20_ku:long_name = "instrument configuration: str in use" ;
    flag_instr_conf_rx_str_in_use_20_ku:flag_values = 0b, 1b, 2b, 3b, 4b ;
    flag_instr_conf_rx_str_in_use_20_ku:flag_meanings = "no_str_tracker tracker_1 tracker_2 tracker_3 attref_file" ;
    flag_instr_conf_rx_str_in_use_20_ku:comment = "Star tracker identification flag showing the source of the platform pointing. 0: No Star Tracker data used. 1: Data from Star Tracker 1 used. 2: Data from Star Tracker 2 used. 3: Data from Star Tracker 3 used. 4: Data from the Star Tracker selected on board by AOCS used." ;
    flag_instr_conf_rx_str_in_use_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

flag_instr_conf_rx_str_in_use_21_ku(time_21_ku)

```
byte flag_instr_conf_rx_str_in_use_21_ku(time_21_ku) ;
    flag_instr_conf_rx_str_in_use_21_ku:_FillValue = -128b ;
    flag_instr_conf_rx_str_in_use_21_ku:long_name = "instrument configuration: str in use" ;
    flag_instr_conf_rx_str_in_use_21_ku:flag_values = 0b, 1b, 2b, 3b, 4b ;
    flag_instr_conf_rx_str_in_use_21_ku:flag_meanings = "no_str_tracker tracker_1 tracker_2 tracker_3 attref_file" ;
    flag_instr_conf_rx_str_in_use_21_ku:comment = "Star tracker identification flag showing the source of the platform pointing. 0: No Star Tracker data used. 1: Data from Star Tracker 1 used. 2: Data from Star Tracker 2 used. 3: Data from Star Tracker 3 used. 4: Data from the Star Tracker selected on board by AOCS used – FBR SARIn." ;
    flag_instr_conf_rx_str_in_use_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

flag_instr_conf_rx_str_in_use_85_ku(time_85_ku)

```
byte flag_instr_conf_rx_str_in_use_85_ku(time_85_ku) ;
    flag_instr_conf_rx_str_in_use_85_ku:_FillValue = -128b ;
    flag_instr_conf_rx_str_in_use_85_ku:long_name = "instrument configuration: str in use" ;
    flag_instr_conf_rx_str_in_use_85_ku:flag_values = 0b, 1b, 2b, 3b, 4b ;
    flag_instr_conf_rx_str_in_use_85_ku:flag_meanings = "no_str_tracker tracker_1 tracker_2 tracker_3 attref_file" ;
    flag_instr_conf_rx_str_in_use_85_ku:comment = "Star tracker identification flag showing which the source of the platform pointing. 0: No Star Tracker data used. 1: Data from Star Tracker 1 used. 2: Data from Star Tracker 2 used. 3: Data from Star Tracker 3 used. 4: Data from the Star Tracker selected on board by AOCS used – FBR SAR." ;
    flag_instr_conf_rx_str_in_use_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

flag_instr_conf_rx_trk_mode_20_ku(time_20_ku)

```
byte flag_instr_conf_rx_trk_mode_20_ku(time_20_ku) ;
    flag_instr_conf_rx_trk_mode_20_ku :_FillValue = -128b ;
    flag_instr_conf_rx_trk_mode_20_ku :long_name = « instrument configuration : tracking mode » ;
    flag_instr_conf_rx_trk_mode_20_ku :flag_values = 0b, 1b, 2b, 3b ;
    flag_instr_conf_rx_trk_mode_20_ku:flag_meanings = "unknown lrm sar sarin" ;
    flag_instr_conf_rx_trk_mode_20_ku:comment = "This flag indicates the tracking mode of the SIRAL instrument." ;
    flag_instr_conf_rx_trk_mode_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

flag_instr_conf_rx_trk_mode_21_ku(time_21_ku)

```
byte flag_instr_conf_rx_trk_mode_21_ku(time_21_ku) ;
    flag_instr_conf_rx_trk_mode_21_ku :_FillValue = -128b ;
    flag_instr_conf_rx_trk_mode_21_ku :long_name = « instrument configuration : tracking mode » ;
    flag_instr_conf_rx_trk_mode_21_ku :flag_values = 0b, 1b, 2b, 3b ;
    flag_instr_conf_rx_trk_mode_21_ku:flag_meanings = "unknown lrm sar sarin" ;
    flag_instr_conf_rx_trk_mode_21_ku:comment = "This flag indicates the tracking mode of the SIRAL instrument - FBR SARIn." ;
    flag_instr_conf_rx_trk_mode_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

flag_instr_conf_rx_trk_mode_85_ku(time_85_ku)

```
byte flag_instr_conf_rx_trk_mode_85_ku(time_85_ku) ;
    flag_instr_conf_rx_trk_mode_85_ku :_FillValue = -128b ;
    flag_instr_conf_rx_trk_mode_85_ku :long_name = « instrument configuration : tracking mode » ;
    flag_instr_conf_rx_trk_mode_85_ku :flag_values = 0b, 1b, 2b, 3b ;
    flag_instr_conf_rx_trk_mode_85_ku:flag_meanings = "unknown lrm sar sarin" ;
    flag_instr_conf_rx_trk_mode_85_ku:comment = "This flag indicates the tracking mode of the SIRAL instrument - FBR SAR." ;
    flag_instr_conf_rx_trk_mode_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

flag_instr_mode_att_ctrl_20_ku(time_20_ku)

```
byte flag_instr_mode_att_ctrl_20_ku (time_20_ku) ;
    flag_instr_mode_att_ctrl_20_ku :_FillValue = -128b ;
    flag_instr_mode_att_ctrl_20_ku :long_name = « mode id : platform
                                    attitude control » ;
    flag_instr_mode_att_ctrl_20_ku :flag_values = 0b, 1b, 2b ;
    flag_instr_mode_att_ctrl_20_ku:flag_meanings = "unknown
                                    local_normal_pointing
                                    yaw_steering";
    flag_instr_mode_att_ctrl_20_ku:comment = "Platform attitude control
                                    mode from instrument
                                    configuration bits in L0." ;
    flag_instr_mode_att_ctrl_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

flag_instr_mode_att_ctrl_21_ku(time_21_ku)

```
byte flag_instr_mode_att_ctrl_21_ku (time_21_ku) ;
    flag_instr_mode_att_ctrl_21_ku :_FillValue = -128b ;
    flag_instr_mode_att_ctrl_21_ku :long_name = « mode id : platform
                                    attitude control » ;
    flag_instr_mode_att_ctrl_21_ku :flag_values = 0b, 1b, 2b ;
    flag_instr_mode_att_ctrl_21_ku:flag_meanings = "unknown
                                    local_normal_pointing
                                    yaw_steering";
    flag_instr_mode_att_ctrl_21_ku:comment = "Platform attitude control
                                    mode from instrument
                                    configuration bits in L0." ;
    flag_instr_mode_att_ctrl_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

flag_instr_mode_att_ctrl_85_ku(time_85_ku)

```
byte flag_instr_mode_att_ctrl_85_ku (time_85_ku) ;
    flag_instr_mode_att_ctrl_85_ku :_FillValue = -128b ;
    flag_instr_mode_att_ctrl_85_ku :long_name = « mode id : platform
                                        attitude control » ;
    flag_instr_mode_att_ctrl_85_ku :flag_values = 0b, 1b, 2b ;
    flag_instr_mode_att_ctrl_85_ku:flag_meanings = "unknown
                                        local_normal_pointing
                                        yaw_steering" ;
    flag_instr_mode_att_ctrl_85_ku:comment = "Platform attitude control
                                        mode from instrument
                                        configuration bits in L0." ;
    flag_instr_mode_att_ctrl_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

flag_instr_mode_flags_20_ku(time_20_ku)

```
byte flag_instr_mode_flags_20_ku(time_20_ku) ;
    flag_instr_mode_flags_20_ku:_FillValue = -128b ;
    flag_instr_mode_flags_20_ku:long_name = "mode id – identifies the sarin
                                        degraded case and the CAL4 flag "
                                        ;
    flag_instr_mode_flags_20_ku:flag_masks = 2b, 1b ;
    flag_instr_mode_flags_20_ku:flag_meanings = "sarin_degraded_case
                                        cal4_packet_detection";
    flag_instr_mode_flags_20_ku:comment = "Flags related to sub-modes of
                                        SARIn mode from instrument
                                        configuration bits in L0." ;
    flag_instr_mode_flags_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

flag_instr_mode_flags_21_ku(time_21_ku)

```
byte flag_instr_mode_flags_21_ku(time_21_ku) ;
    flag_instr_mode_flags_21_ku:_FillValue = -128b ;
    flag_instr_mode_flags_21_ku:long_name = "mode id – identifies the sarin degraded case and the CAL4 flag" ;
    flag_instr_mode_flags_21_ku:flag_masks = 2b, 1b ;
    flag_instr_mode_flags_21_ku:flag_meanings = "sarin_degraded_case cal4_packet_detection" ;
    flag_instr_mode_flags_21_ku:comment = "Flags related to sub-modes of SARIn mode from instrument configuration bits in L0 - FBR SARIn." ;flag_instr_mode_flags_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

flag_instr_mode_flags_85_ku(time_85_ku)

```
byte flag_instr_mode_flags_85_ku(time_85_ku) ;
    flag_instr_mode_flags_85_ku:_FillValue = -128b ;
    flag_instr_mode_flags_85_ku:long_name = "mode id – identifies the sarin degraded case and the CAL4 flag" ;
    flag_instr_mode_flags_85_ku:flag_masks = 2b, 1b ;
    flag_instr_mode_flags_85_ku:flag_meanings = "sarin_degraded_case cal4_packet_detection";
    flag_instr_mode_flags_85_ku:comment = "Flags related to sub-modes of SARIn mode from instrument configuration bits in L0 - FBR SAR." ;
    flag_instr_mode_flags_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

flag_instr_mode_op_20_ku(time_20_ku)

```
byte flag_instr_mode_op_20_ku(time_20_ku) ;
    flag_instr_mode_op_20_ku :_FillValue = -128b ;
    flag_instr_mode_op_20_ku :long_name = « mode id – identifies the siral
                                  instrument measurement mode » ;
    flag_instr_mode_op_20_ku :flag_values = 1b, 2b, 3b ;
    flag_instr_mode_op_20_ku :flag_meanings = « lrm sar sarin » ;
    flag_instr_mode_op_20_ku :comment = « Instrument measurement mode
                                  derived from configuration bits in
                                  L0. » ;
    flag_instr_mode_op_20_ku :coordinates = "lon_20_ku lat_20_ku" ;
```

flag_instr_mode_op_21_ku(time_21_ku)

```
byte flag_instr_mode_op_21_ku(time_21_ku) ;
    flag_instr_mode_op_21_ku :_FillValue = -128b ;
    flag_instr_mode_op_21_ku :long_name = « mode id – identifies the siral
                                  instrument measurement mode » ;
    flag_instr_mode_op_21_ku :flag_values = 1b, 2b, 3b ;
    flag_instr_mode_op_21_ku :flag_meanings = « lrm sar sarin » ;
    flag_instr_mode_op_21_ku :comment = « Instrument measurement mode
                                  derived from configuration bits in
                                  L0 – FBR SARIn. » ;
    flag_instr_mode_op_21_ku :coordinates = "lon_21_ku lat_21_ku" ;
```

flag_instr_mode_op_85_ku(time_85_ku)

```
byte flag_instr_mode_op_85_ku(time_85_ku) ;
    flag_instr_mode_op_85_ku :_FillValue = -128b ;
    flag_instr_mode_op_85_ku :long_name = « mode id – identifies the siral
                                  instrument measurement mode » ;
    flag_instr_mode_op_85_ku :flag_values = 1b, 2b, 3b ;
    flag_instr_mode_op_85_ku :flag_meanings = « lrm sar sarin » ;
    flag_instr_mode_op_85_ku :comment = « Instrument measurement mode
                                  derived from configuration bits in
                                  L0 – FBR SAR. » ;
```

```
flag_instr_mode_op_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

flag_mcd_20_ku(time_20_ku)

Note: refer to section 3.5 for the flag meaning definition **Error! Bookmark not defined.**

```
int flag_mcd_20_ku(time_20_ku) ;
    flag_mcd_20_ku:_FillValue = -1 ;
    flag_mcd_20_ku:long_name = "measurement confidence flags" ;
    flag_mcd_20_ku:flag_masks = -2147483648, 1073741824, 536870912,
        268435456, 134217728, 67108864, 33554432,
        16777216, 8388608, 4194304, 2097152,
        1048576, 524288, 262144, 131072, 65536,
        32768, 16384, 8192, 4096, 2048, 128, 64,
        32, 16, 8, 1 ;
    flag_mcd_20_ku:flag_meanings = "block_degraded blank_block
        datation_degraded orbit_prop_error
        orbit_file_change orbit_gap echo_saturated
        other_echo_error sarin_rx1_error
        sarin_rx2_error window_delay_error
        agc_error cal1_missing cal1_default
        doris_uso_missing ccal1_default
        trk_echo_error echo_rx1_error
        echo_rx2_error npm_error cal1_pwr_corr_type
        phase_pert_cor_missing cal2_missing
        cal2_default power_scale_error
        attitude_cor_missing
        phase_pert_cor_default" ;
    flag_mcd_20_ku:comment = "Measurement confidence flags. Generally the
        MCD flags indicate problems when set. If the
        whole MCD is 0 then no problems or non-nominal
        conditions were detected. Serious errors are
        indicated by setting the most significant bit,
        i.e. block_degraded, in which case the block
        must not be processed. Other error settings can
        be regarded as warnings." ;
    flag_mcd_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

flag_mcd_21_ku(time_21_ku)

Note: refer to section 3.5 for the flag meaning definition

```
int flag_mcd_21_ku(time_21_ku) ;
    flag_mcd_21_ku:_FillValue = -1 ;
    flag_mcd_21_ku:long_name = "measurement confidence flags" ;
    flag_mcd_21_ku:flag_masks = -2147483648, 1073741824, 536870912,
                            268435456, 134217728, 67108864, 33554432,
                            16777216, 8388608, 4194304, 2097152,
                            1048576, 524288, 262144, 131072, 65536,
                            32768, 16384, 8192, 4096, 2048, 128, 64,
                            32, 16, 8, 1 ;
    flag_mcd_21_ku:flag_meanings = "block_degraded blank_block
                            datation_degraded orbit_prop_error
                            orbit_file_change orbit_gap echo_saturated
                            other_echo_error sarin_rx1_error
                            sarin_rx2_error window_delay_error
                            agc_error cal1_missing cal1_default
                            doris_uso_missing ccal1_default
                            trk_echo_error echo_rx1_error
                            echo_rx2_error npm_error
                            attitude_cor_missing cal1_pwr_corr_type " ;
    flag_mcd_21_ku:comment = "Measurement confidence flags. Generally the
                         MCD flags indicate problems when set. If the
                         whole MCD is 0 then no problems or non-nominal
                         conditions were detected. Serious errors are
                         indicated by setting the most significant bit,
                         i.e. block_degraded, in which case the block
                         must not be processed. Other error settings can
                         be regarded as warnings - FBR SARIn." ;
    flag_mcd_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

flag_mcd_85_ku(time_85_ku)

Note: refer to section 3.5 for the flag meaning definition

```
int flag_mcd_85_ku(time_85_ku) ;
    flag_mcd_85_ku:_FillValue = -1 ;
    flag_mcd_85_ku:long_name = "measurement confidence flags" ;
    flag_mcd_85_ku:flag_masks = -2147483648, 1073741824, 536870912,
                               268435456, 134217728, 67108864, 33554432,
                               16777216, 8388608, 4194304, 2097152,
                               1048576, 524288, 262144, 131072, 65536,
                               32768, 16384, 8192, 4096, 2048, 128, 64,
                               32, 16, 8, 1 ;
    flag_mcd_85_ku:flag_meanings = "block_degraded blank_block
                               datation_degraded orbit_prop_error
                               orbit_file_change orbit_gap echo_saturated
                               other_echo_error sarin_rx1_error
                               sarin_rx2_error window_delay_error
                               agc_error cal1_missing cal1_default
                               doris_uso_missing ccal1_default
                               trk_echo_error echo_rx1_error
                               echo_rx2_error npm_error
                               attitude_cor_missing cal1_pwr_corr_type " ;
    flag_mcd_85_ku:comment = "Measurement confidence flags. Generally the
                            MCD flags indicate problems when set. If the
                            whole MCD is 0 then no problems or non-nominal
                            conditions were detected. Serious errors are
                            indicated by setting the most significant bit,
                            i.e. block_degraded, in which case the block
                            must not be processed. Other error settings can
                            be regarded as warnings - FBR SAR." ;
    flag_mcd_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

flag_trk_cycle_20_ku(time_20_ku)

```
short flag_trk_cycle_20_ku(time_20_ku) ;
    flag_trk_cycle_20_ku:long_name = "trk cycle report (as extracted from
                    the L0)" ;
    flag_trk_cycle_20_ku:_FillValue =  -32768 ;
    flag_trk_cycle_20_ku: flag_values = 0s, 1s, 2s, 3s, 7s ;
    flag_trk_cycle_20_ku:flag_meanings = "no_errors loss_of_echo
                    run_time_error echo_saturation_error
                    unknown_error" ;
    flag_trk_cycle_20_ku:comment = "Flags for errors or information about
                    L1b 20Hz power waveform for LRM/FDM case." ;
    flag_trk_cycle_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

h0_applied_20_ku(time_20_ku)

```
int h0_applied_20_ku(time_20_ku) ;
    h0_applied_20_ku:_FillValue = -2147483648 ;
    h0_applied_20_ku:units = "seconds" ;
    h0_applied_20_ku:long_name = "h0 initial height word" ;
    h0_applied_20_ku:add_offset = 0. ;
    h0_applied_20_ku:scale_factor = 4.88e-11 ;
    h0_applied_20_ku:comment = "The H0 (initial altitude instruction)
            forwarded from telemetry." ;
    h0_applied_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

h0_applied_21_ku(time_21_ku)

```
int h0_applied_21_ku(time_21_ku) ;
    h0_applied_21_ku:_FillValue = -2147483648 ;
    h0_applied_21_ku:units = "seconds" ;
    h0_applied_21_ku:long_name = "h0 initial height word" ;
    h0_applied_21_ku:add_offset = 0. ;
    h0_applied_21_ku:scale_factor = 4.88e-11 ;
    h0_applied_21_ku:comment = "The H0 (initial altitude instruction)
            forwarded from telemetry - FBR SARIn." ;
    h0_applied_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

h0_applied_85_ku(time_85_ku)

```
int h0_applied_85_ku(time_85_ku) ;
    h0_applied_85_ku:_FillValue = -2147483648 ;
    h0_applied_85_ku:units = "seconds" ;
    h0_applied_85_ku:long_name = "h0 initial height word" ;
    h0_applied_85_ku:add_offset = 0. ;
    h0_applied_85_ku:scale_factor = 4.88e-11 ;
    h0_applied_85_ku:comment = "The H0 (initial altitude instruction)
            forwarded from telemetry - FBR SAR." ;
    h0_applied_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

h0_fai_word_20_ku(time_20_ku)

```
int  h0_fai_word_20_ku(time_20_ku) ;
    h0_fai_word_20_ku:_FillValue = -2147483648 ;
    h0_fai_word_20_ku:units = "seconds" ;
    h0_fai_word_20_ku:long_name = "fine word fai" ;
    h0_fai_word_20_ku:add_offset = 0. ;
    h0_fai_word_20_ku:scale_factor = 4.88e-11 ;
    h0_fai_word_20_ku:comment = "This is the Fine Altitude Instruction
            (FAI), computed from H0 and COR2." ;
    h0_fai_word_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

h0_fai_word_21_ku(time_21_ku)

```
int  h0_fai_word_21_ku(time_21_ku) ;
    h0_fai_word_21_ku:_FillValue = -2147483648 ;
    h0_fai_word_21_ku:units = "seconds" ;
    h0_fai_word_21_ku:long_name = "fine word fai" ;
    h0_fai_word_21_ku:add_offset = 0. ;
    h0_fai_word_21_ku:scale_factor = 4.88e-11 ;
    h0_fai_word_21_ku:comment = "This is the Fine Altitude Instruction
            (FAI), computed from H0 and COR2 - FBR SARIn." ;
    h0_fai_word_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

h0_fai_word_85_ku(time_85_ku)

```
int  h0_fai_word_85_ku(time_85_ku) ;
    h0_fai_word_85_ku:_FillValue = -2147483648 ;
    h0_fai_word_85_ku:units = "seconds" ;
    h0_fai_word_85_ku:long_name = "fine word fai" ;
    h0_fai_word_85_ku:add_offset = 0. ;
    h0_fai_word_85_ku:scale_factor = 4.88e-11 ;
    h0_fai_word_85_ku:comment = "This is the Fine Altitude Instruction
              (FAI), computed from H0 and COR2 - FBR SAR." ;
    h0_fai_word_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

h0_lai_word_20_ku(time_20_ku)

```
int h0_lai_word_20_ku(time_20_ku) ;
    h0_lai_word_20_ku:_FillValue = -2147483648 ;
    h0_lai_word_20_ku:units = "seconds" ;
    h0_lai_word_20_ku:long_name = "coarse range word lai" ;
    h0_lai_word_20_ku:add_offset = 0. ;
    h0_lai_word_20_ku:scale_factor = 1.25e-08 ;
    h0_lai_word_20_ku:comment = "This is the Coarse Altitude Instruction
              (LAI), computed from H0 and COR2." ;
    h0_lai_word_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

h0_lai_word_21_ku(time_21_ku)

```
int h0_lai_word_21_ku(time_21_ku) ;
    h0_lai_word_21_ku:_FillValue = -2147483648 ;
    h0_lai_word_21_ku:units = "seconds" ;
    h0_lai_word_21_ku:long_name = "coarse range word lai" ;
    h0_lai_word_21_ku:add_offset = 0. ;
    h0_lai_word_21_ku:scale_factor = 1.25e-08 ;
    h0_lai_word_21_ku:comment = "This is the Coarse Altitude Instruction
              (LAI), computed from H0 and COR2 - FBR SARIn." ;
    h0_lai_word_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

h0_lai_word_85_ku(time_85_ku)

```
int h0_lai_word_85_ku(time_85_ku) ;
    h0_lai_word_85_ku:_FillValue = -2147483648 ;
    h0_lai_word_85_ku:units = "seconds" ;
    h0_lai_word_85_ku:long_name = "coarse range word lai" ;
    h0_lai_word_85_ku:add_offset = 0. ;
    h0_lai_word_85_ku:scale_factor = 1.25e-08 ;
    h0_lai_word_85_ku:comment = "This is the Coarse Altitude Instruction
              (LAI), computed from H0 and COR2 - FBR SAR." ;
    h0_lai_word_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

hf_fluct_total_cor_01(time_cor_01)

```
int hf_fluct_total_cor_01(time_cor_01) ;
    hf_fluct_total_cor_01:_FillValue = -2147483648 ;
    hf_fluct_total_cor_01:units = "m" ;
    hf_fluct_total_cor_01:long_name = "1-way dynamic atmospheric correction" ;
    hf_fluct_total_cor_01:standard_name = "sea_surface_height_correction_due_to_air_pressure_and_wind_at_high_frequency" ;
    hf_fluct_total_cor_01:add_offset = 0. ;
    hf_fluct_total_cor_01:scale_factor = 0.001 ;
    hf_fluct_total_cor_01:comment = "High frequency fluctuations of the sea surface topography due to high frequency air pressure and wind effects. Also known as DAC (Dynamical Atmospheric Correction). This 1-way correction is computed at the altimeter [time_cor_01] time-tag from the interpolation of 2 meteorological fields that surround the altimeter time-tag. The inverse barometric correction [inv_bar_cor_01] is included in this field. This correction is to be accounted for during the computation of height  in order to account for both the depression of the ocean surface caused by the local barometric pressure and the high-frequency effects caused by wind forcing. This correction is an alternative to [inv_bar_cor_01] and therefore only one should be used. " ;
    hf_fluct_total_cor_01:source = "MOG2D 2.1.0" ;
    hf_fluct_total_cor_01:institution = "LEGOS/CLS/CNES" ;
    hf_fluct_total_cor_01:coordinates = "lat_cor_01 lon_cor_01";
```

ind_first_meas_20hz_01 (time_cor_01)

```
int ind_first_meas_20hz_01(time_cor_01) ;
        ind_first_meas_20hz_01:_FillValue = -2147483648 ;
        ind_first_meas_20hz_01:comment = "Index of the first 20Hz measurement of the 1Hz packet. " ;
        ind_first_meas_20hz_01:long_name = "index of the first 20Hz measurement: 1 Hz" ;
        ind_first_meas_20hz_01:units = "count" ;
```

ind_ meas_1hz_20_ku (time_20_ku)

short ind_meas_1hz_20_ku(time_20_ku) ;

ind_meas_1hz_20_ku:_FillValue = -32768s ;

ind_meas_1hz_20_ku:comment = "Index of the 1Hz measurement to which belongs the 20Hz measurement." ;

ind_meas_1hz_20_ku:coordinates = "lon_20_ku lat_20_ku";

ind_meas_1hz_20_ku:long_name = "index of the 1Hz measurement: 20 Hz ku band" ;

ind_meas_1hz_20_ku:units = "count" ;

instr_cor_gain_rx_20_ku(time_20_ku)

```
int instr_cor_gain_rx_20_ku(time_20_ku) ;
    instr_cor_gain_rx_20_ku:_FillValue = -2147483648 ;
    instr_cor_gain_rx_20_ku:units = "dB" ;
    instr_cor_gain_rx_20_ku:long_name = "instrument gain correction (rx
                                         only chain)" ;
    instr_cor_gain_rx_20_ku:add_offset = 0. ;
    instr_cor_gain_rx_20_ku:scale_factor = 0.01 ;
    instr_cor_gain_rx_20_ku:comment = "Instrument Gain Correction (Rx only
             chain). It includes the power variation from CAL1 and the
             AGC calibration values." ;
    instr_cor_gain_rx_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

instr_cor_gain_rx_21_ku(time_21_ku)

```
int instr_cor_gain_rx_21_ku(time_21_ku) ;
    instr_cor_gain_rx_21_ku:_FillValue = -2147483648 ;
    instr_cor_gain_rx_21_ku:units = "dB" ;
    instr_cor_gain_rx_21_ku:long_name = "instrument gain correction (rx
                                         only chain)" ;
    instr_cor_gain_rx_21_ku:add_offset = 0. ;
    instr_cor_gain_rx_21_ku:scale_factor = 0.01 ;
    instr_cor_gain_rx_21_ku:comment = "Instrument Gain Correction (Rx only
             chain). It includes the power variation from CAL1 and the
             AGC calibration values - FBR SARIn." ;
```

```
instr_cor_gain_rx_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

instr_cor_gain_rx_85_ku(time_85_ku)

```
int instr_cor_gain_rx_85_ku(time_85_ku) ;
    instr_cor_gain_rx_85_ku:_FillValue = -2147483648;
    instr_cor_gain_rx_85_ku:units = "dB" ;
    instr_cor_gain_rx_85_ku:long_name = "instrument gain correction (rx
                                        only chain)" ;
    instr_cor_gain_rx_85_ku:add_offset = 0. ;
    instr_cor_gain_rx_85_ku:scale_factor = 0.01 ;
    instr_cor_gain_rx_85_ku:comment = "Instrument Gain Correction (Rx only
             chain). It includes the power variation from CAL1 and the
             AGC calibration values - FBR SAR." ;
    instr_cor_gain_rx_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

instr_cor_gain_tx_rx_20_ku(time_20_ku)

```
int instr_cor_gain_tx_rx_20_ku(time_20_ku) ;
    instr_cor_gain_tx_rx_20_ku:_FillValue = -2147483648 ;
    instr_cor_gain_tx_rx_20_ku:units = "dB" ;
    instr_cor_gain_tx_rx_20_ku:long_name = "instrument gain correction (tx-
                                           rx chain)" ;
    instr_cor_gain_tx_rx_20_ku:add_offset = 0. ;
    instr_cor_gain_tx_rx_20_ku:scale_factor = 0.01 ;
    instr_cor_gain_tx_rx_20_ku:comment = "Instrument Gain Correction (Tx-Rx
             chain). It includes the power variation from CAL1 and the
             AGC calibration values." ;
    instr_cor_gain_tx_rx_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

instr_cor_gain_tx_rx_21_ku(time_21_ku)

```
int instr_cor_gain_tx_rx_21_ku(time_21_ku) ;
    instr_cor_gain_tx_rx_21_ku:_FillValue = -2147483648 ;
    instr_cor_gain_tx_rx_21_ku:units = "dB" ;
    instr_cor_gain_tx_rx_21_ku:long_name = "instrument gain correction (tx-
                                            rx chain)" ;
    instr_cor_gain_tx_rx_21_ku:add_offset = 0. ;
    instr_cor_gain_tx_rx_21_ku:scale_factor = 0.01 ;
    instr_cor_gain_tx_rx_21_ku:comment = "Instrument Gain Correction (Tx-Rx
            chain). It includes the power variation from CAL1 and the
            AGC calibration values - FBR SARIn." ;
    instr_cor_gain_tx_rx_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

instr_cor_gain_tx_rx_85_ku(time_85_ku)

```
int instr_cor_gain_tx_rx_85_ku(time_85_ku) ;
    instr_cor_gain_tx_rx_85_ku:_FillValue = -2147483648 ;
    instr_cor_gain_tx_rx_85_ku:units = "dB" ;
    instr_cor_gain_tx_rx_85_ku:long_name = "instrument gain correction (tx-
                                            rx chain)" ;
    instr_cor_gain_tx_rx_85_ku:add_offset = 0. ;
    instr_cor_gain_tx_rx_85_ku:scale_factor = 0.01 ;
    instr_cor_gain_tx_rx_85_ku:comment = "Instrument Gain Correction (Tx-Rx
            chain). It includes the power variation from CAL1 and the
            AGC calibration values - FBR SAR." ;
    instr_cor_gain_tx_rx_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

instr_cor_range_rx_20_ku(time_20_ku)

```
int instr_cor_range_rx_20_ku(time_20_ku) ;
    instr_cor_range_rx_20_ku:_FillValue = -2147483648 ;
    instr_cor_range_rx_20_ku:units = "m" ;
    instr_cor_range_rx_20_ku:long_name = "1-way instrument range correction
                                         (rx only chain)" ;
    instr_cor_range_rx_20_ku:add_offset = 0. ;
    instr_cor_range_rx_20_ku:scale_factor = 0.001 ;
    instr_cor_range_rx_20_ku:comment = "1-way instrument Range Correction
            (Rx only chain). Calibration correction to range on channel
            2 applied at L1B. It includes: the internal path delay from
            CAL1, the external group delay from ground characterisation
            and the vertical component of CoM - Antenna distance.";
    instr_cor_range_rx_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

instr_cor_range_rx_21_ku(time_21_ku)

```
int instr_cor_range_rx_21_ku(time_21_ku) ;
    instr_cor_range_rx_21_ku:_FillValue = -2147483648 ;
    instr_cor_range_rx_21_ku:units = "m" ;
    instr_cor_range_rx_21_ku:long_name = "1-way instrument range correction
                                         (rx only chain)" ;
    instr_cor_range_rx_21_ku:add_offset = 0. ;
    instr_cor_range_rx_21_ku:scale_factor = 0.001 ;
    instr_cor_range_rx_21_ku:comment = "1-way instrument Range Correction
            (Rx only chain). It includes: the internal path delay from
            CAL1, the external group delay from ground characterisation
            and the vertical component of the CoM - Antenna distance -
            FBR SARIn." ;
    instr_cor_range_rx_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

instr_cor_range_rx_85_ku(time_85_ku)

```
int instr_cor_range_rx_85_ku(time_85_ku) ;
    instr_cor_range_rx_85_ku:_FillValue = -2147483648 ;
    instr_cor_range_rx_85_ku:units = "m" ;
    instr_cor_range_rx_85_ku:long_name = "1-way instrument range correction
                                        (rx only chain)" ;
    instr_cor_range_rx_85_ku:add_offset = 0. ;
    instr_cor_range_rx_85_ku:scale_factor = 0.001 ;
    instr_cor_range_rx_85_ku:comment = "1-way instrument Range Correction
            (Rx only chain). It includes: the internal path delay from
            CAL1, the external group delay from ground characterisation
            and the vertical component of the CoM – Antenna distance –
            FBR SAR." ;
    instr_cor_range_rx_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

instr_cor_range_tx_rx_20_ku(time_20_ku)

```
int instr_cor_range_tx_rx_20_ku(time_20_ku) ;
    instr_cor_range_tx_rx_20_ku:_FillValue = -2147483648 ;
    instr_cor_range_tx_rx_20_ku:units = "m" ;
    instr_cor_range_tx_rx_20_ku:long_name = "1-way instrument range
                                        correction (tx-rx chain)" ;
    instr_cor_range_tx_rx_20_ku:add_offset = 0. ;
    instr_cor_range_tx_rx_20_ku:scale_factor = 0.001 ;
    instr_cor_range_tx_rx_20_ku:comment = "1-way instrument Range
            Correction (Tx-Rx chain). Calibration correction to range on
            channel 1 applied at L1B. It includes the internal path
            delay from CAL1, the external group delay from ground
            characterisation and the CoM – Antenna distance." ;
    instr_cor_range_tx_rx_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

instr_cor_range_tx_rx_21_ku(time_21_ku)

```
int instr_cor_range_tx_rx_21_ku(time_21_ku) ;
    instr_cor_range_tx_rx_21_ku:_FillValue = -2147483648 ;
    instr_cor_range_tx_rx_21_ku:units = "m" ;
    instr_cor_range_tx_rx_21_ku:long_name = "1-way instrument range correction (tx-rx chain)" ;
    instr_cor_range_tx_rx_21_ku:add_offset = 0. ;
    instr_cor_range_tx_rx_21_ku:scale_factor = 0.001 ;
    instr_cor_range_tx_rx_21_ku:comment = "1-way instrument Range Correction (Tx-Rx chain) - Calibration correction to range on channel 1 applied at L1B. It includes the internal path delay from CAL1, the external group delay from ground characterisation and the CoM - Antenna distance - FBR SARIn." ;
    instr_cor_range_tx_rx_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

instr_cor_range_tx_rx_85_ku(time_85_ku)

```
int instr_cor_range_tx_rx_85_ku(time_85_ku) ;
    instr_cor_range_tx_rx_85_ku:_FillValue = -2147483648 ;
    instr_cor_range_tx_rx_85_ku:units = "m" ;
    instr_cor_range_tx_rx_85_ku:long_name = "1-way instrument range correction (tx-rx chain)" ;
    instr_cor_range_tx_rx_85_ku:add_offset = 0. ;
    instr_cor_range_tx_rx_85_ku:scale_factor = 0.001 ;
    instr_cor_range_tx_rx_85_ku:comment = "1-way instrument Range Correction (Tx-Rx chain) - Calibration correction to range on channel 1 applied at L1B. It includes the internal path delay from CAL1, the external group delay from ground characterisation and the CoM - Antenna distance - FBR SAR." ;
    instr_cor_range_tx_rx_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

instr_ext_ph_cor_20_ku(time_20_ku)

```
int instr_ext_ph_cor_20_ku(time_20_ku) ;
    instr_ext_ph_cor_20_ku:_FillValue = -2147483648 ;
    instr_ext_ph_cor_20_ku:units = "rad" ;
    instr_ext_ph_cor_20_ku:long_name = "external phase correction taken from
                                the ipfdb file" ;
    instr_ext_ph_cor_20_ku:add_offset = 0. ;
    instr_ext_ph_cor_20_ku:scale_factor = 1.e-06 ;
    instr_ext_ph_cor_20_ku:comment = "External phase correction taken from
                                the IPFDB file (SARIn only) to be added
                                to the internal phase correction term.
                                The external phase correction is the
                                temperature-averaged component of
                                external inter-channel phase difference
                                derived from phase difference sensitive
                                antenna subsystem, waveguides and
                                instrument waveguide switches. The
                                external phase correction doesn't
                                contain internal instrument effects of
                                calibration coupler and duplexer which
                                are included in the internal phase
                                difference correction." ;
    instr_ext_ph_cor_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

instr_ext_ph_cor_21_ku(time_21_ku)

```
int instr_ext_ph_cor_21_ku(time_21_ku) ;
    instr_ext_ph_cor_21_ku:_FillValue = -2147483648 ;
    instr_ext_ph_cor_21_ku:units = "rad" ;
    instr_ext_ph_cor_21_ku:long_name = "external phase correction taken from
                                        the ipfdb file" ;
    instr_ext_ph_cor_21_ku:add_offset = 0. ;
    instr_ext_ph_cor_21_ku:scale_factor = 1.e-06 ;
    instr_ext_ph_cor_21_ku:comment = "External phase correction taken from
                                      the IPFDB file (SARIn only) to be added
                                      to the internal phase correction term.
                                      The external phase correction is the
                                      temperature-averaged component of
                                      external inter-channel phase difference
                                      derived from phase difference sensitive
                                      antenna subsystem, waveguides and
                                      instrument waveguide switches. The
                                      external phase correction doesn't
                                      contain internal instrument effects of
                                      calibration coupler and duplexer which
                                      are included in the internal phase
                                      difference correction - FBR SARIn." ;
    instr_ext_ph_cor_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

instr_int_ph_cor_20_ku(time_20_ku)

```
int instr_int_ph_cor_20_ku(time_20_ku) ;
    instr_int_ph_cor_20_ku:_FillValue = -2147483648 ;
    instr_int_ph_cor_20_ku:units = "rad" ;
    instr_int_ph_cor_20_ku:long_name = "internal phase correction computed
                                from the CAL-4" ;
    instr_int_ph_cor_20_ku:add_offset = 0. ;
    instr_int_ph_cor_20_ku:scale_factor = 1.e-06 ;
    instr_int_ph_cor_20_ku:comment = "Internal phase difference correction
                                computed from the CAL-4 packets. It is
                                set from the latest available CAL-4
                                packet. Applicable to SARIn only." ;
    instr_int_ph_cor_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

instr_int_ph_cor_21_ku(time_21_ku)

```
int instr_int_ph_cor_21_ku(time_21_ku) ;
    instr_int_ph_cor_21_ku:_FillValue = -2147483648 ;
    instr_int_ph_cor_21_ku:units = "rad" ;
    instr_int_ph_cor_21_ku:long_name = "internal phase correction computed
                                from the cal-4" ;
    instr_int_ph_cor_21_ku:add_offset = 0. ;
    instr_int_ph_cor_21_ku:scale_factor = 1.e-06 ;
    instr_int_ph_cor_21_ku:comment = "Internal phase difference correction
                                computed from the CAL-4 packets. Set to
                                zero in FBR. Applicable to SARin only -
                                FBR SARIn." ;
    instr_int_ph_cor_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

inter_base_vec_20_ku(time_20_ku,space_3d)

```
int inter_base_vec_20_ku(time_20_ku, space_3d) ;
    inter_base_vec_20_ku :_FillValue = -2147483648 ;
    inter_base_vec_20_ku:units = "m" ;
    inter_base_vec_20_ku:long_name = "interferometric baseline direction
                                      vector in CRF" ;
    inter_base_vec_20_ku:add_offset = 0. ;
    inter_base_vec_20_ku:scale_factor = 1.e-06 ;
    inter_base_vec_20_ku:comment = "Interferometer baseline direction
                                   vector. This is the direction vector
                                   from Tx-Rx antenna reference point to
                                   Rx only antenna reference point
                                   described in the CryoSat Reference
                                   Frame. The 3 components are given
                                   according to the 'space_3d' dimension:
                                   [1] x, [2] y, [3] z." ;
    inter_base_vec_20_ku :coordinates = "lon_20_ku lat_20_ku" ;
```

inter_base_vec_21_ku(time_21_ku,space_3d)

```
int inter_base_vec_21_ku(time_21_ku, space_3d) ;
    inter_base_vec_21_ku :_FillValue = -2147483648 ;
    inter_base_vec_21_ku:units = "m" ;
    inter_base_vec_21_ku:long_name = "interferometric baseline direction
                                      vector in CRF" ;
    inter_base_vec_21_ku:add_offset = 0. ;
    inter_base_vec_21_ku:scale_factor = 1.e-06 ;
    inter_base_vec_21_ku:comment = "Interferometric Baseline direction
                                   vector. This is the direction vector
                                   from Tx-Rx antenna reference point to
                                   Rx only antenna reference point
                                   described in the CryoSat Reference
                                   Frame. The 3 components are given
                                   according to the 'space_3d' dimension:
                                   [1] x, [2] y, [3] z - FBR SARIn." ;
    inter_base_vec_21_ku :coordinates = "lon_21_ku lat_21_ku" ;
```

inter_base_vec_85_ku(time_85_ku,space_3d)

```
int inter_base_vec_85_ku(time_85_ku, space_3d) ;
    inter_base_vec_85_ku :_FillValue = -2147483648 ;
    inter_base_vec_85_ku:units = "m" ;
    inter_base_vec_85_ku:long_name = "interferometric baseline direction
                                      vector in CRF" ;
    inter_base_vec_85_ku:add_offset = 0. ;
    inter_base_vec_85_ku:scale_factor = 1.e-06 ;
    inter_base_vec_85_ku:comment = "Interferometric Baseline direction
                                    vector. This is the direction vector
                                    from Tx-Rx antenna reference point to
                                    Rx only antenna reference point
                                    described in the CryoSat Reference
                                    Frame. The 3 components are given
                                    according to the 'space_3d' dimension:
                                    [1] x, [2] y, [3] z - FBR SAR." ;
    inter_base_vec_85_ku :coordinates = "lon_85_ku lat_85_ku" ;
```

inv_bar_cor_01(time_cor_01)

```
int inv_bar_cor_01(time_cor_01) ;
    inv_bar_cor_01:_FillValue = -2147483648;
    inv_bar_cor_01:units = "m" ;
    inv_bar_cor_01:long_name = "inverse barometric correction (1-way)";
    inv_bar_cor_01:standard_name =
"sea_surface_height_correction_due_to_air_pressure_at_low_frequency" ;
    inv_bar_cor_01:add_offset = 0. ;
    inv_bar_cor_01:scale_factor = 0.001 ;
    inv_bar_cor_01:comment = "Inverse Barometric Correction. This 1-way
                    correction is computed at the altimeter
                    [time_cor_01] time-tag from the interpolation of
                    2 meteorological fields that surround the
                    altimeter time-tag. This correction is to be
                    accounted for during the computation of height
                    in order to correct this range measurement for
                    the depression of the ocean surface caused by
                    the local barometric pressure. This correction
                    is an alternative to [hf_fluct_total_cor_01] and
                    only one should be used. (1-way correction). " ;
    inv_bar_cor_01:source = "European Centre for Medium Range Weather
                    Forecasting" ;
    inv_bar_cor_01:institution = "ECMWF" ;
    inv_bar_cor_01:coordinates = "lat_cor_01 lon_cor_01";
```

iono_cor_01(time_cor_01)

```
int iono_cor_01(time_cor_01) ;
    iono_cor_01:_FillValue = -2147483648 ;
    iono_cor_01:units = "m" ;
    iono_cor_01:long_name = "model ionospheric correction (1-way)" ;
    iono_cor_01:standard_name = "altimeter_range_correction_due_to_ionosphere" ;
    iono_cor_01:add_offset = 0. ;
    iono_cor_01:scale_factor = 0.001 ;
    iono_cor_01:comment = "Model Ionospheric Correction. This correction is
              to be accounted for during the computation of height in
              order to correct this range measurement for ionospheric
              range delays of the radar pulse. This correction is an
              alternative to [iono_cor_gim_01_ku] and only one should
              be used. See S. K. Llewellyn, R. B. Bent, A. S. C. I. H.
              B. FL, U. S. N. T. I. Service, Space and Missile Systems
              Organization (U.S.), Documentation and Description of the
              Bent Ionospheric Model. U.S. Department of Commerce,
              National Technical Information Service, 1973. " ;
    iono_cor_01:source = "Bent" ;
    iono_cor_01:institution = "Bent" ;
    iono_cor_01:coordinates = "lat_cor_01 lon_cor_01";
```

iono_cor_gim_01(time_cor_01)

```
int iono_cor_gim_01(time_cor_01) ;
    iono_cor_gim_01:_FillValue = -2147483648 ;
    iono_cor_gim_01:units = "m" ;
    iono_cor_gim_01:long_name = "gim ionospheric correction (1-way)" ;
    iono_cor_gim_01:standard_name =
"altimeter_range_correction_due_to_ionosphere" ;
    iono_cor_gim_01:add_offset = 0. ;
    iono_cor_gim_01:scale_factor = 0.001 ;
    iono_cor_gim_01:comment = "GIM Ionospheric Correction. This correction
                               is to be accounted for during the
                               computation of height in order to
                               correct this range measurement for
                               ionospheric range delays of the radar
                               pulse. This correction is an alternative
                               to [iono_cor_01_ku] and only one should
                               be used. " ;
    iono_cor_gim_01:source = "GIM" ;
    iono_cor_gim_01:institution = "NASA/JPL" ;
    iono_cor_gim_01:coordinates = "lat_cor_01 lon_cor_01";
```

lat_20_ku(time_20_ku)

```
int lat_20_ku(time_20_ku) ;
    lat_20_ku:units = "degrees_north" ;
    lat_20_ku:_FillValue = -2147483648 ;
    lat_20_ku:long_name = "20 Hz latitude" ;
    lat_20_ku:standard_name = "latitude" ;
    lat_20_ku:scale_factor = 1.e-07 ;
    lat_20_ku:add_offset = 0. ;
    lat_20_ku:comment = "Latitude of nadir location [-90,+90]. Positive
                         latitude is North latitude, negative latitude is
                         South latitude. Note the scale factor." ;
    lat_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

lat_21_ku(time_21_ku)

```
int lat_21_ku(time_21_ku) ;
    lat_21_ku:units = "degrees_north" ;
    lat_21_ku:_FillValue = -2147483648 ;
    lat_21_ku:long_name = "20 Hz latitude" ;
    lat_21_ku:standard_name = "latitude" ;
    lat_21_ku:scale_factor = 1.e-07 ;
    lat_21_ku:add_offset = 0. ;
    lat_21_ku:comment = "Latitude of nadir location [-90,+90]. Positive
                         latitude is North latitude, negative latitude is
                         South latitude. Note the scale factor - FBR
                         SARIn." ;
    lat_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

lat_85_ku(time_85_ku)

```
int lat_85_ku(time_85_ku) ;
    lat_85_ku:units = "degrees_north" ;
    lat_85_ku:_FillValue = -2147483648 ;
    lat_85_ku:long_name = "20 Hz latitude" ;
    lat_85_ku:standard_name = "latitude" ;
    lat_85_ku:scale_factor = 1.e-07 ;
    lat_85_ku:add_offset = 0. ;
    lat_85_ku:comment = "Latitude of nadir location [-90,+90]. Positive
                        latitude is North latitude, negative latitude is
                        South latitude. Note the scale factor - FBR
                        SAR." ;
    lat_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

lat_cor_01(time_cor_01)

```
int lat_cor_01(time_cor_01) ;
    lat_cor_01:_FillValue = -2147483648 ;
    lat_cor_01:units = "degrees_north" ;
    lat_cor_01:long_name = "latitude of corrections" ;
    lat_cor_01:standard_name = "latitude" ;
    lat_cor_01:add_offset = 0. ;
    lat_cor_01:scale_factor = 1.e-07 ;
    lat_cor_01:comment = "Latitude of nadir location [-90,+90]. Positive
                latitude is North latitude, negative latitude is South
                latitude. Note the scale factor." ;
    lat_cor_01:coordinates = "lon_cor_01 lat_cor_01";
```

lat_avg_01_ku(time_avg_01_ku)

```
int lat_avg_01_ku(time_avg_01_ku) ;
    lat_avg_01_ku:_FillValue = -2147483648 ;
    lat_avg_01_ku:units = "degrees_north" ;
    lat_avg_01_ku:long_name = "latitude of measurement" ;
```

```
    lat_avg_01_ku:standard_name = "latitude" ;
    lat_avg_01_ku:add_offset = 0. ;
    lat_avg_01_ku:scale_factor = 1.e-07 ;
    lat_avg_01_ku:comment = "Latitude of nadir location [-90,+90]. Positive
                latitude is North latitude, negative latitude is South
                latitude. Note the scale factor." ;
    lat_avg_01_ku:coordinates = "lon_avg_01_ku lat_avg_01_ku";
```

lat_plrm_01_ku(time_plrm_01_ku)

```
int lat_plrm_01_ku(time_plrm_01_ku) ;
    lat_plrm_01_ku:_FillValue = -2147483648 ;
    lat_plrm_01_ku:units = "degrees_north" ;
    lat_plrm_01_ku:long_name = "latitude of measurement" ;
    lat_plrm_01_ku:standard_name = "latitude" ;
    lat_plrm_01_ku:add_offset = 0. ;
    lat_plrm_01_ku:scale_factor = 1.e-07 ;
    lat_plrm_01_ku:comment = "Latitude of nadir location [-90,+90].
                Positive latitude is North latitude, negative latitude
                is South latitude. Note the scale factor." ;
    lat_plrm_01_ku:coordinates = "lon_plrm_01_ku lat_plrm_01_ku";
```

lat_plrm_20_ku(time_plrm_20_ku)

```
int lat_plrm_20_ku(time_plrm_20_ku) ;
    lat_plrm_20_ku:_FillValue = -2147483648 ;
    lat_plrm_20_ku:units = "degrees_north" ;
    lat_plrm_20_ku:long_name = "latitude of measurement" ;
    lat_plrm_20_ku:standard_name = "latitude" ;
    lat_plrm_20_ku:add_offset = 0. ;
    lat_plrm_20_ku:scale_factor = 1.e-07 ;
    lat_plrm_20_ku:comment = "Latitude of nadir location [-90,+90].
                Positive latitude is North latitude, negative latitude
                is South latitude. Note the scale factor." ;
    lat_plrm_20_ku:coordinates = "lon_plrm_20_ku lat_plrm_20_ku";
```

load_tide_01(time_cor_01)

```
int load_tide_01(time_cor_01) ;
    load_tide_01:_FillValue = -2147483648 ;
    load_tide_01:units = “m” ;
    load_tide_01:long_name = “ocean loading tide (1-way)” ;
    load_tide_01:add_offset = 0. ;
    load_tide_01:scale_factor = 0.001 ;
    load_tide_01:comment = “Ocean loading tide. This correction is to be
            accounted for during the computation of height  to remove the
            effect of local tidal distortion to the Earth’s crust, caused by
            increasing weight of ocean as local water tide rises. “ ;
    load_tide_01:source = “FES2004” ;
    load_tide_01:institution = “GSFC” ;
    load_tide_01:coordinates = “lat_cor_01 lon_cor_01”;
```

lon_20_ku(time_20_ku)

```
int lon_20_ku (time_20_ku) ;
    lon_20_ku:units = “degrees_east” ;
    lon_20_ku:_FillValue = -2147483648 ;
    lon_20_ku:long_name = “20 Hz longitude” ;
    lon_20_ku:standard_name = “longitude” ;
    lon_20_ku:scale_factor = 1.e-07 ;
    lon_20_ku:add_offset = 0. ;
    lon_20_ku:comment = “Longitude of nadir location [-180,+180]. Positive
                         longitude is East relative to Greenwich meridian.
                         Note the scale factor.” ;
    lon_20_ku:coordinates = “lon_20_ku lat_20_ku”;
```

lon_21_ku(time_21_ku)

```
int lon_21_ku (time_21_ku) ;
    lon_21_ku:units = "degrees_east" ;
    lon_21_ku:_FillValue = -2147483648 ;
    lon_21_ku:long_name = "20 Hz longitude" ;
    lon_21_ku:standard_name = "longitude" ;
    lon_21_ku:scale_factor = 1.e-07 ;
    lon_21_ku:add_offset = 0. ;
    lon_21_ku:comment = " Longitude of nadir location [-180,+180]. Positive
                         longitude is East relative to Greenwich meridian.
                         Note the scale factor - FBR SARIn." ;
    lon_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

lon_85_ku(time_85_ku)

```
int lon_85_ku (time_85_ku) ;
    lon_85_ku:units = "degrees_east" ;
    lon_85_ku:_FillValue = -2147483648 ;
    lon_85_ku:long_name = "20 Hz longitude" ;
    lon_85_ku:standard_name = "longitude" ;
    lon_85_ku:scale_factor = 1.e-07 ;
    lon_85_ku:add_offset = 0. ;
    lon_85_ku:comment = " Longitude of nadir location [-180,+180]. Positive
                         longitude is East relative to Greenwich meridian.
                         Note the scale factor - FBR SAR." ;
    lon_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

lon_cor_01(time_cor_01)

```
int lon_cor_01(time_cor_01) ;
    lon_cor_01:_FillValue = -2147483648 ;
    lon_cor_01:units = "degrees_east" ;
    lon_cor_01:long_name = "longitude of corrections" ;
    lon_cor_01:standard_name = "longitude" ;
    lon_cor_01:add_offset = 0. ;
    lon_cor_01:scale_factor = 1.e-07 ;
    lon_cor_01:comment = "Longitude of corrections [-180,+180]. Positive
              longitude is East relative to Greenwich meridian. Note the
              scale factor." ;
    lon_cor_01:coordinates = "lon_cor_01 lat_cor_01";
```

lon_avg_01_ku(time_avg_01_ku)

```
int lon_avg_01_ku(time_avg_01_ku) ;
    lon_avg_01_ku:_FillValue = -2147483648 ;
    lon_avg_01_ku:units = "degrees_east" ;
    lon_avg_01_ku:long_name = "longitude of measurement" ;
    lon_avg_01_ku:standard_name = "longitude" ;
    lon_avg_01_ku:add_offset = 0. ;
    lon_avg_01_ku:scale_factor = 1.e-07 ;
    lon_avg_01_ku:comment = "Longitude of nadir location [-180,+180].
              Positive longitude is East relative to Greenwich meridian.
              Note the scale factor." ;
    lon_avg_01_ku:coordinates = "lon_avg_01_ku lat_avg_01_ku";
```

lon_plrm_01_ku(time_plrm_01_ku)

```
int lon_plrm_01_ku(time_plrm_01_ku) ;
    lon_plrm_01_ku:_FillValue = -2147483648 ;
    lon_plrm_01_ku:units = "degrees_east" ;
    lon_plrm_01_ku:long_name = "longitude of measurement" ;
    lon_plrm_01_ku:standard_name = "longitude" ;
    lon_plrm_01_ku:add_offset = 0. ;
```

```
lon_plrm_01_ku:scale_factor = 1.e-07 ;
lon_plrm_01_ku:comment = "Longitude of nadir location [-180,+180].
          Positive longitude is East relative to Greenwich meridian.
          Note the scale factor." ;
lon_plrm_01_ku:coordinates = "lon_plrm_01_ku lat_plrm_01_ku";
```

lon_plrm_20_ku(time_plrm_20_ku)

```
int lon_plrm_20_ku(time_plrm_20_ku) ;
    lon_plrm_20_ku:_FillValue = -2147483648 ;
    lon_plrm_20_ku:units = "degrees_east" ;
    lon_plrm_20_ku:long_name = "longitude of measurement" ;
    lon_plrm_20_ku:standard_name = "longitude" ;
    lon_plrm_20_ku:add_offset = 0. ;
    lon_plrm_20_ku:scale_factor = 1.e-07 ;
    lon_plrm_20_ku:comment = "Longitude of nadir location [-180,+180].
          Positive longitude is East relative to Greenwich meridian.
          Note the scale factor." ;
    lon_plrm_20_ku:coordinates = "lon_plrm_20_ku lat_plrm_20_ku";
```

look_angle_start_20_ku(time_20_ku)

```
int look_angle_start_20_ku(time_20_ku) ;
    look_angle_start_20_ku:_FillValue = -2147483648 ;
    look_angle_start_20_ku:units = "rad" ;
    look_angle_start_20_ku:long_name = "look angle start" ;
    look_angle_start_20_ku:add_offset = 0. ;
    look_angle_start_20_ku:scale_factor = 1.e-07 ;
    look_angle_start_20_ku:comment = "Value of Look Angle for the first
          single look echo in the stack. It is the angle between: (a)
          nadir direction from the satellite CoM to the surface, (b)
          direction from satellite to surface location. The look angle
          depends purely on geometry . SAR/SARIn only." ;
    look_angle_start_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

look_angle_stop_20_ku(time_20_ku)

```
int look_angle_stop_20_ku(time_20_ku) ;
    look_angle_stop_20_ku:_FillValue = -2147483648 ;
    look_angle_stop_20_ku:units = "rad" ;
    look_angle_stop_20_ku:long_name = " look angle stop" ;
    look_angle_stop_20_ku:add_offset = 0. ;
    look_angle_stop_20_ku:scale_factor = 1.e-07 ;
    look_angle_stop_20_ku:comment = "Value of Look Angle for the last
            single look echo in the stack.  It is the angle between: (a)
            nadir direction from the satellite CoM to the surface, (b)
            direction from satellite to surface location. The look angle
            depends purely on geometry. SAR/SARIn only." ;
    look_angle_stop_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

mod_dry_tropo_cor_01(time_cor_01)

```
int mod_dry_tropo_cor_01(time_cor_01) ;
    mod_dry_tropo_cor_01:_FillValue = -2147483648 ;
    mod_dry_tropo_cor_01:units = "m" ;
    mod_dry_tropo_cor_01:long_name = "dry tropospheric correction (1-way)" ;
    mod_dry_tropo_cor_01:standard_name = "altimeter_range_correction_due_to_dry_troposphere" ;
    mod_dry_tropo_cor_01:add_offset = 0. ;
    mod_dry_tropo_cor_01:scale_factor = 0.001 ;
    mod_dry_tropo_cor_01:comment = "Model Dry Tropospheric Correction. This
                                    1-way correction is computed at the
                                    [time_cor_01] altimeter time-tag from the
                                    interpolation of 2 meteorological fields
                                    that surround the altimeter time-tag.
                                    This correction is to be accounted for
                                    during the computation of height in
                                    order to correct for the propagation
                                    delay to the radar pulse, caused by the
                                    dry-gas component of the Earth's
                                    atmosphere. " ;
    mod_dry_tropo_cor_01:source = "European Centre for Medium Range Weather
                                   Forecasting" ;
    mod_dry_tropo_cor_01:institution = "ECMWF" ;
    mod_dry_tropo_cor_01:coordinates = "lat_cor_01 lon_cor_01";
```

mod_wet_tropo_cor_01(time_cor_01)

```
int mod_wet_tropo_cor_01(time_cor_01) ;
    mod_wet_tropo_cor_01:_FillValue = -2147483648 ;
    mod_wet_tropo_cor_01:units = "m" ;
    mod_wet_tropo_cor_01:long_name = "wet tropospheric correction (1-way)" ;
    mod_wet_tropo_cor_01:standard_name = "altimeter_range_correction_due_to_wet_troposphere" ;
    mod_wet_tropo_cor_01:add_offset = 0.0 ;
    mod_wet_tropo_cor_01:scale_factor = 0.001 ;
    mod_wet_tropo_cor_01:comment = "Model Wet Tropospheric Correction. This 1-way correction is computed at the time_cor_01 altimeter time-tag from the interpolation of 2 meteorological fields that surround the altimeter time-tag. This correction is to be accounted for during the computation of height in order to correct for the propagation delay to the radar pulse, caused by the H2O component of the Earth's atmosphere. " ;
    mod_wet_tropo_cor_01:source = "European Centre for Medium Range Weather Forecasting" ;
    mod_wet_tropo_cor_01:institution = "ECMWF" ;
    mod_wet_tropo_cor_01:coordinates = "lat_cor_01 lon_cor_01";
```

noise_power_20_ku(time_20_ku)

```
int noise_power_20_ku(time_20_ku) ;
    noise_power_20_ku :_FillValue = -2147483648 ;
    noise_power_20_ku :units = « dB » ;
    noise_power_20_ku:long_name = "noise power measurement" ;
    noise_power_20_ku:add_offset = 0.0 ;
    noise_power_20_ku:scale_factor = 0.01 ;
    noise_power_20_ku:comment = "Noise power measurement to be the noise
              floor of measurement echoes. In SAR/SARIn it is estimated on
              the L1B 20Hz multilooked power waveform. In LRM it is
              converted from telemetry units and scaled according to the
              proper AGC value. This field is set to the default value
              equal to -9999.99 when the telemetry contains zero." ;
    noise_power_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

noise_power_21_ku(time_21_ku)

```
int noise_power_21_ku(time_21_ku) ;
    noise_power_21_ku:_FillValue = -2147483648 ;
    noise_power_21_ku :units = « dB » ;
    noise_power_21_ku:long_name = "noise power measurement" ;
    noise_power_21_ku:add_offset = 0.0 ;
    noise_power_21_ku:scale_factor = 0.01 ;
    noise_power_21_ku:comment = "Noise power measurement to be the noise
              floor of FBR measurement echoes. In SARIn it is estimated on
              the L1B 20Hz multilooked power waveform. This field is set to
              the default value equal to -9999.99 when the telemetry
              contains zero - FBR SARIn." ;
    noise_power_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

noise_power_85_ku(time_85_ku)

```
int noise_power_85_ku(time_85_ku) ;
    noise_power_85_ku:_FillValue = -2147483648 ;
    noise_power_85_ku :units = « dB » ;
    noise_power_85_ku:long_name = "noise power measurement" ;
    noise_power_85_ku:add_offset =  0.0 ;
    noise_power_85_ku:scale_factor = 0.01 ;
    noise_power_85_ku:comment = "Noise power to be the noise floor of FBR
          measurement echoes. In SAR it is estimated on the L1B 20Hz
          multilooked power waveform. This field is set to the default
          value equal to -9999.99 when the telemetry contains zero -
          FBR SAR." ;
    noise_power_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

ocean_tide_01(time_cor_01)

```
int ocean_tide_01(time_cor_01) ;
    ocean_tide_01:_FillValue = -2147483648 ;
    ocean_tide_01:units = "m" ;
    ocean_tide_01:long_name = "elastic ocean tide (1-way)" ;
    ocean_tide_01:standard_name = "sea_surface_height_amplitude_due_to_elastic_ocean_tide" ;
    ocean_tide_01:add_offset = 0. ;
    ocean_tide_01:scale_factor = 0.001 ;
    ocean_tide_01:comment = "Ocean Tide. This correction is to be accounted
             for during the computation of height to remove the effect
             of local tide and adjust the measurement to the mean sea
             surface. This is the pure ocean tide, not including the
             corresponding loading tide [load_tide_01] or the
             equilibrium long-period ocean tide height
             [ocean_tide_eq_01]. The permanent tide (zero frequency) is
             not included in this parameter because it is included in
             the geoid [geoid_01] and mean sea surface
             [mean_sea_surf_sea_ice_01]." ;
    ocean_tide_01:source = "FES2004" ;
    ocean_tide_01:institution = "LEGOS/CNES" ;
    ocean_tide_01:coordinates = "lat_cor_01 lon_cor_01";
```

ocean_tide_eq_01(time_cor_01)

```
int ocean_tide_eq_01(time_cor_01) ;
    ocean_tide_eq_01:_FillValue = -2147483648 ;
    ocean_tide_eq_01:units = "m" ;
    ocean_tide_eq_01:long_name = "long period equilibrium ocean tide (1-way)" ;
    ocean_tide_eq_01:standard_name = "sea_surface_height_amplitude_due_to_equilibrium_ocean_tide" ;
    ocean_tide_eq_01:add_offset = 0. ;
    ocean_tide_eq_01:scale_factor = 0.001 ;
    ocean_tide_eq_01:comment = "Long Period Equilibrium Ocean Tide. This
            correction is to be accounted for during the computation of
            height to remove the effect of the oceanic response to the
            single tidal forcing." ;
    ocean_tide_eq_01:source = "FES2004" ;
    ocean_tide_eq_01:institution = "LEGOS/CNES" ;
        ocean_tide_eq_01:coordinates = "lat_cor_01 lon_cor_01";
```

off_nadir_pitch_angle_str_20_ku(time_20_ku)

```
int off_nadir_pitch_angle_str_20_ku(time_20_ku) ;
    off_nadir_pitch_angle_str_20_ku:_FillValue = -2147483648 ;
    off_nadir_pitch_angle_str_20_ku:units = "degrees" ;
    off_nadir_pitch_angle_str_20_ku:long_name = "antenna bench pitch
            angle";
    off_nadir_pitch_angle_str_20_ku:comment = "Pitch angle with respect to
            the nadir pointing, measured by the STRs and
            post-processed by the ground facility." ;
    off_nadir_pitch_angle_str_20_ku:coordinates = "lon_20_ku lat_20_ku";
    off_nadir_pitch_angle_str_20_ku:add_offset = 0.0 ;
    off_nadir_pitch_angle_str_20_ku:scale_factor = 1.e-07;
```

off_nadir_roll_angle_str_20_ku(time_20_ku)

```
int off_nadir_roll_angle_str_20_ku(time_20_ku) ;
    off_nadir_roll_angle_str_20_ku:_FillValue = -2147483648 ;
    off_nadir_roll_angle_str_20_ku:units = “degrees” ;
    off_nadir_roll_angle_str_20_ku:long_name = “antenna bench roll angle”;
    off_nadir_roll_angle_str_20_ku:comment = “Roll angle with respect to
                      the nadir pointing, measured by the STRs and
                      post-processed by the ground facility.” ;
    off_nadir_roll_angle_str_20_ku:coordinates = “lon_20_ku lat_20_ku”;
    off_nadir_roll_angle_str_20_ku:add_offset = 0.0 ;
    off_nadir_roll_angle_str_20_ku:scale_factor = 1.e-07 ;
```

off_nadir_yaw_angle_str_20_ku(time_20_ku)

```
int off_nadir_yaw_angle_str_20_ku(time_20_ku) ;
    off_nadir_yaw_angle_str_20_ku:_FillValue = -2147483648 ;
    off_nadir_yaw_angle_str_20_ku:units = “degrees” ;
    off_nadir_yaw_angle_str_20_ku:long_name = “antenna bench yaw angle”;
    off_nadir_yaw_angle_str_20_ku:comment = “Yaw angle with respect to the
                      nadir pointing, measured by the STRs and post-
                      processed by the ground facility.” ;
    off_nadir_yaw_angle_str_20_ku:coordinates = “lon_20_ku lat_20_ku”;
    off_nadir_yaw_angle_str_20_ku:add_offset = 0.0 ;
    off_nadir_yaw_angle_str_20_ku:scale_factor = 1.e-07 ;
```

orb_alt_rate_20_ku(time_20_ku)

```
int orb_alt_rate_20_ku(time_20_ku) ;
    orb_alt_rate_20_ku:_FillValue = -2147483648 ;
    orb_alt_rate_20_ku:units = "m/s" ;
    orb_alt_rate_20_ku:long_name = "altitude rate of the Satellite CoM with
                                    respect to the reference ellipsoid" ;
    orb_alt_rate_20_ku:add_offset = 0. ;
    orb_alt_rate_20_ku:scale_factor = 0.001 ;
    orb_alt_rate_20_ku:comment = "Instantaneous altitude rate at the
             satellite CoM with respect to the reference ellipsoid
             [WGS84]." ;
    orb_alt_rate_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

orb_alt_rate_21_ku(time_21_ku)

```
int orb_alt_rate_21_ku(time_21_ku) ;
    orb_alt_rate_21_ku:_FillValue = -2147483648 ;
    orb_alt_rate_21_ku:units = "m/s" ;
    orb_alt_rate_21_ku:long_name = "altitude rate of the Satellite CoM with
                                    respect to the reference ellipsoid" ;
    orb_alt_rate_21_ku:add_offset = 0. ;
    orb_alt_rate_21_ku:scale_factor = 0.001 ;
    orb_alt_rate_21_ku:comment = "Instantaneous altitude rate of the
             satellite CoM with respect to the reference ellipsoid
             [WGS84] - FBR SARIn." ;
    orb_alt_rate_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

orb_alt_rate_85_ku(time_85_ku)

```
int orb_alt_rate_85_ku(time_85_ku) ;
    orb_alt_rate_85_ku:_FillValue = -2147483648 ;
    orb_alt_rate_85_ku:units = "m/s" ;
    orb_alt_rate_85_ku:long_name = "altitude rate of the Satellite CoM with
                                  respect to the reference ellipsoid" ;
    orb_alt_rate_85_ku:add_offset = 0. ;
    orb_alt_rate_85_ku:scale_factor = 0.001 ;
    orb_alt_rate_85_ku:comment = "Instantaneous altitude rate of the
             satellite CoM with respect to the reference ellipsoid
             [WGS84] - FBR SAR." ;
    orb_alt_rate_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

ph_diff_waveform_20_ku(time_20_ku, ns_20_ku)

```
int ph_diff_waveform_20_ku(time_20_ku, ns_20_ku) ;
    ph_diff_waveform_20_ku:_FillValue = -2147483648 ;
    ph_diff_waveform_20_ku:units = "rad" ;
    ph_diff_waveform_20_ku:long_name = "l1b Phase Difference waveform" ;
    ph_diff_waveform_20_ku:add_offset = 0. ;
    ph_diff_waveform_20_ku:scale_factor = 1.e-06 ;
    ph_diff_waveform_20_ku:comment = "The L1b 20Hz phase difference
                                     waveform is a fully-calibrated, high
                                     resolution, multilooked phase
                                     difference computed from the complex
                                     echoes on the two receiving channels
                                     (SARIn only)." ;
    ph_diff_waveform_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

ph_slope_cor_20_ku(time_20_ku)

```
int ph_slope_cor_20_ku(time_20_ku) ;
    ph_slope_cor_20_ku:_FillValue = -2147483648 ;
    ph_slope_cor_20_ku:units = "rad" ;
    ph_slope_cor_20_ku:long_name = "phase slope correction" ;
    ph_slope_cor_20_ku:add_offset = 0. ;
    ph_slope_cor_20_ku:scale_factor = 1.e-06 ;
    ph_slope_cor_20_ku:comment = "Differential group delay phase difference
             slope correction across the whole bandwidth (SARIn only).
             It is composed by fixed contributions from IPFDB and by
             variable contributions covering differences between the
             CAL-1 and CAL-4 paths. Applied in L1B SARIn products." ;
    ph_slope_cor_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

ph_slope_cor_21_ku(time_21_ku)

```
int ph_slope_cor_21_ku(time_21_ku) ;
    ph_slope_cor_21_ku:_FillValue = -2147483648 ;
    ph_slope_cor_21_ku:units = "rad" ;
    ph_slope_cor_21_ku:long_name = "phase slope correction" ;
    ph_slope_cor_21_ku:add_offset = 0. ;
    ph_slope_cor_21_ku:scale_factor = 1.e-06 ;
    ph_slope_cor_21_ku:comment = "Differential group delay phase difference
             slope correction across the whole bandwidth (SARIn only).
             It is composed by fixed contributions from IPFDB and by
             variable contributions covering differences between the
             CAL-1 and CAL-4 paths - FBR SARIn" ;
    ph_slope_cor_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

pole_tide_01(time_cor_01)

```
int pole_tide_01(time_cor_01) ;
    pole_tide_01:_FillValue = -2147483648 ;
    pole_tide_01:units = "m" ;
    pole_tide_01:long_name = "geocentric polar tide (1-way)" ;
    pole_tide_01:add_offset = 0. ;
    pole_tide_01:scale_factor = 0.001 ;
    pole_tide_01:comment = "Geocentric polar tide. This correction is to be
                accounted for during the computation of heightto remove a
                long-period distortion of the Earth's crust. Although called
                a 'tide' this is in fact caused by variations in centrifugal
                force as the Earth's rotational axis moves its geographic
                location. " ;
    pole_tide_01:source = "Wahr [1985] Deformation of the Earth induced by
                polar motion - J. Geophys. Res. (Solid Earth), 90, 9363-
                9368." ;
    pole_tide_01:institution = "IERS/CNES" ;
    pole_tide_01:coordinates = "lat_cor_01 lon_cor_01";
```

pwr_waveform_20_ku(time_20_ku, ns_20_ku)

```
ushort pwr_waveform_20_ku(time_20_ku, ns_20_ku) ;
    pwr_waveform_20_ku:units = "count" ;
    pwr_waveform_20_ku:long_name = "l1b power waveform scaled 0-65535" ;
    pwr_waveform_20_ku:add_offset = 0us ;
    pwr_waveform_20_ku:scale_factor = 1us ;
    pwr_waveform_20_ku:comment = "The L1B 20Hz power waveform is a fully-
                calibrated waveform. For LRM it is a low
                resolution pulse limited waveform. For
                SAR/SARIn it is a high resolution multilooked
                waveform. Units are counts scaled to fit in
                the range 0-65535." ;
    pwr_waveform_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

pwr_waveform_avg_01_ku(time_avg_01_ku, ns_avg_01_ku)

```
ushort pwr_waveform_avg_01_ku(time_avg_01_ku, ns_avg_01_ku) ;
    pwr_waveform_avg_01_ku:units = "count" ;
    pwr_waveform_avg_01_ku:long_name = "1hz l1b power waveform scaled 0-65535" ;
    pwr_waveform_avg_01_ku:add_offset = 0us ;
    pwr_waveform_avg_01_ku:scale_factor = 1us ;
    pwr_waveform_avg_01_ku:comment = "The L1B 1Hz averaged power waveform is a fully-calibrated low resolution pulse limited power waveform. For SAR/SARIn it is a Pseudo-LRM power waveform obtained by averaging all individual L0 echoes covering approx 1 second after range compression. Units are counts scaled to fit in the range 0-65535." ;
    pwr_waveform_avg_01_ku:coordinates = "lon_avg_01_ku lat_avg_01_ku";
```

pwr_waveform_plrm_01_ku(time_plrm_01_ku, ns_plrm_01_ku)

```
ushort pwr_waveform_plrm_01_ku(time_plrm_01_ku, ns_plrm_01_ku) ;
    pwr_waveform_plrm_01_ku:units = "count" ;
    pwr_waveform_plrm_01_ku:long_name = "1hz l1b power waveform scaled 0-65535" ;
    pwr_waveform_plrm_01_ku:add_offset = 0us ;
    pwr_waveform_plrm_01_ku:scale_factor = 1us ;
    pwr_waveform_plrm_01_ku:comment = "The L1B 1Hz averaged power waveform is a fully-calibrated low resolution pulse limited power waveform. For SAR/SARIn it is a Pseudo-LRM power waveform obtained by averaging all individual L0 echoes covering approx 1 second after range compression. Units are counts scaled to fit in the range 0-65535." ;
    pwr_waveform_plrm_01_ku:coordinates = "lon_plrm_01_ku lat_plrm_01_ku";
```

pwr_waveform_plrm_20_ku(time_plrm_20_ku, ns_plrm_20_ku)

```
ushort pwr_waveform_plrm_20_ku(time_plrm_20_ku, ns_plrm_20_ku) ;
    pwr_waveform_plrm_20_ku:units = "count" ;
```

```
    pwr_waveform_plrm_20_ku:long_name = "20hz l1b power waveform scaled 0-65535" ;
    pwr_waveform_plrm_20_ku:add_offset = 0us ;
    pwr_waveform_plrm_20_ku:scale_factor = 1us ;
    pwr_waveform_plrm_20_ku:comment = "The L1B 20Hz averaged power waveform
            is a fully-calibrated low resolution pulse limited power
            waveform. For SAR/SARIn it is a Pseudo-LRM power waveform
            obtained by averaging all individual L0 echoes covering
            160regori 0.05 second after range compression. Units are
            counts scaled to fit in the range 0-65535." ;
    pwr_waveform_plrm_20_ku:coordinates = "lon_plrm_20_ku lat_plrm_20_ku";
```

rec_count_20_ku(time_20_ku)

```
int rec_count_20_ku(time_20_ku) ;
    rec_count_20_ku:units = "count" ;
    rec_count_20_ku:long_name = "record counter" ;
    rec_count_20_ku:comment = "Record counter - progressive counter
                               incremented by 1 for each record. Surface
                               Sample counter for SAR/SARin L1B products."
                               ;
    rec_count_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

rec_count_21_ku(time_21_ku)

```
int rec_count_21_ku(time_21_ku) ;
    rec_count_21_ku:units = "count" ;
    rec_count_21_ku:long_name = "record counter" ;
    rec_count_21_ku:comment = "Record counter - progressive counter
                               incremented by 1 for each record. Burst
                               counter for FBR SARIn products." ;
    rec_count_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

rec_count_85_ku(time_85_ku)

```
int rec_count_85_ku(time_85_ku) ;
    rec_count_85_ku:units = "count" ;
    rec_count_85_ku:long_name = "record counter" ;
    rec_count_85_ku:comment = "Record counter - progressive counter
                               incremented by 1 for each record. Burst
                               counter for FBR SAR products." ;
    rec_count_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

sat_vel_vec_20_ku(time_20_ku,space_3d)

```
int sat_vel_vec_20_ku(time_20_ku, space_3d) ;
    sat_vel_vec_20_ku:_FillValue = -2147483648 ;
    sat_vel_vec_20_ku:units = "m/s" ;
    sat_vel_vec_20_ku:long_name = "velocity vector in itrf" ;
    sat_vel_vec_20_ku:add_offset = 0. ;
    sat_vel_vec_20_ku:scale_factor = 0.001 ;
    sat_vel_vec_20_ku:comment = "Satellite velocity vector, described in
                               the International Terrestrial Reference
                               Frame in the International Earth Fixed
                               System. This is not a unit vector as the
                               velocity magnitude is also required. The 3
                               components are given according to the
                               'space_3d' dimension: [1] x, [2] y, [3]
                               z.";
    sat_vel_vec_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

sat_vel_vec_21_ku(time_21_ku,space_3d)

```
int sat_vel_vec_21_ku(time_21_ku, space_3d) ;
    sat_vel_vec_21_ku :_FillValue = -2147483648 ;
    sat_vel_vec_21_ku:units = "m/s" ;
    sat_vel_vec_21_ku:long_name = "velocity vector in itrf" ;
    sat_vel_vec_21_ku:add_offset = 0. ;
    sat_vel_vec_21_ku:scale_factor = 0.001 ;
    sat_vel_vec_21_ku:comment = "Satellite velocity vector, described in
                                the International Terrestrial
                                Reference Frame in the International
                                Earth Fixed System. This is not a unit
                                vector as the velocity magnitude is
                                also required. The 3 components are
                                given according to the 'space_3d'
                                dimension: [1] x, [2] y, [3] z - FBR
                                SARIn." ;
    sat_vel_vec_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

sat_vel_vec_85_ku(time_85_ku,space_3d)

```
int sat_vel_vec_85_ku(time_85_ku, space_3d) ;
    sat_vel_vec_85_ku :_FillValue = -2147483648 ;
    sat_vel_vec_85_ku:units = "m/s" ;
    sat_vel_vec_85_ku:long_name = "velocity vector in itrf" ;
    sat_vel_vec_85_ku:add_offset = 0. ;
    sat_vel_vec_85_ku:scale_factor = 0.001 ;
    sat_vel_vec_85_ku:comment = "Satellite velocity, described in the
                                International Terrestrial Reference
                                Frame in the International Earth Fixed
                                System. This is not a unit vector as
                                the velocity magnitude is also
                                required. The 3 components are given
                                according to the 'space_3d' dimension:
                                [1] x, [2] y, [3] z - FBR SAR." ;
    sat_vel_vec_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

seq_count_20_ku(time_20_ku)

```
short seq_count_20_ku(time_20_ku) ;
    seq_count_20_ku:units = "count" ;
    seq_count_20_ku:long_name = "Source Sequence Counter" ;
    seq_count_20_ku:add_offset = 0s ;
    seq_count_20_ku:scale_factor = 1s ;
    seq_count_20_ku:comment = "Source Sequence Counter read from the L0
                                echo telemetry packet.";
    seq_count_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

seq_count_21_ku(time_21_ku)

```
short seq_count_21_ku(time_21_ku) ;
    seq_count_21_ku:units = "count" ;
    seq_count_21_ku:long_name = "Source Sequence Counter" ;
    seq_count_21_ku:add_offset = 0s ;
    seq_count_21_ku:scale_factor = 1s ;
    seq_count_21_ku:comment = "Source Sequence Counter read from the L0
                                echo telemetry packet - FBR SARIn." ;
    seq_count_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

seq_count_85_ku(time_85_ku)

```
short seq_count_85_ku(time_85_ku) ;
    seq_count_85_ku:units = "count" ;
    seq_count_85_ku:long_name = "Source Sequence Counter" ;
    seq_count_85_ku:add_offset = 0s ;
    seq_count_85_ku:scale_factor = 1s ;
    seq_count_85_ku:comment = "Source Sequence Counter read from the L0
                                echo telemetry packet - FBR SAR." ;
    seq_count_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

solid_earth_tide_01(time_cor_01)

```
int solid_earth_tide_01(time_cor_01) ;
    solid_earth_tide_01:_FillValue = -2147483648 ;
    solid_earth_tide_01:units = "m" ;
    solid_earth_tide_01:long_name = "solid earth tide (1-way)" ;
    solid_earth_tide_01:standard_name="sea_surface_height_amplitude_due_to_
earth_tide" ;
    solid_earth_tide_01:add_offset = 0. ;
    solid_earth_tide_01:scale_factor = 0.001 ;
    solid_earth_tide_01:comment = "Solid Earth. This correction is to be
            accounted for during the computation of height to remove the
            effect of local tidal distortion to the Earth's crust, in
            particular by the sun and moon. " ;
    solid_earth_tide_01:source = "Cartwright and Edden [1973] Corrected
            tables of tidal harmonics - J. Geophys. J. R. Astr. Soc.,
            33, 253-264." ;
    solid_earth_tide_01:coordinates = "lat_cor_01 lon_cor_01";
```

stack_centre_20_ku(time_20_ku)

```
short stack_centre_20_ku(time_20_ku) ;
    stack_centre_20_ku:units = "count" ;
    stack_centre_20_ku:_FillValue = -32768s ;
    stack_centre_20_ku:long_name = "gaussian power fitting: center wrt beam
                                   number" ;
    stack_centre_20_ku:add_offset = 0. ;
    stack_centre_20_ku:scale_factor = 0.01 ;
    stack_centre_20_ku:comment = "Position of the centre of Gaussian that
                                 fits the range integrated power of the
                                 single look echoes within a stack. Stack
                                 centre as function of stack beam number.
                                 Applicable to SAR/SARIn only.";
    stack_centre_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

stack_centre_angle_20_ku(time_20_ku)

```
short stack_centre_angle_20_ku(time_20_ku) ;
    stack_centre_angle_20_ku:_FillValue = -32768s ;
    stack_centre_angle_20_ku:units = "rad" ;
    stack_centre_angle_20_ku:long_name = "gaussian power fitting: center
                                          wrt boresight angle" ;
    stack_centre_angle_20_ku:add_offset = 0. ;
    stack_centre_angle_20_ku:scale_factor = 1.e-06 ;
    stack_centre_angle_20_ku:comment = "Position of the centre of Gaussian
                                        that fits the range integrated
                                        power of the single look echoes
                                        within a stack. Centre as function
                                        of the boresight angle, that is the
                                        angle between: (a) antenna
                                        boresight direction, (b) direction
                                        from satellite to surface location.
                                        The pointing angle depends on
                                        geometry and attitude (roll and
                                        pitch). Applicable to SAR/SARIn
                                        only.";;
    stack_centre_angle_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

stack_centre_look_angle_20_ku(time_20_ku)

```
short stack_centre_look_angle_20_ku(time_20_ku) ;
        stack_centre_look_angle_20_ku:_FillValue = -32768s ;
        stack_centre_look_angle_20_ku:add_offset = 0. ;
        stack_centre_look_angle_20_ku:comment = "Position of the centre of Gaussian that fits the range integrated power of the single look echoes within a stack. Centre as function of the look angle, that is the angle between: (a) nadir direction from the satellite CoM to the surface, (b) direction from satellite to surface location. Applicable to SAR/SARIn only. See \'Pitch Estimation for CryoSat by Analysis of Stacks of Single-Look Echoes\' - M. Scagliola, M. Fornari and N. Tagliani - IEEE Geoscience and Remote Sensing Letters, vol. 12, no. 7, pp. 1561-1565, July 2015. Doi: 10.1109/LGRS.2015.2413135" ;
        stack_centre_look_angle_20_ku:coordinates = "lon_20_ku lat_20_ku";
        stack_centre_look_angle_20_ku:long_name = "gaussian power fitting: centre wrt look angle" ;
        stack_centre_look_angle_20_ku:scale_factor = 1.e-06 ;
        stack_centre_look_angle_20_ku:units = "rad" ;
```

stack_gaussian_fitting_residuals_20_ku(time_20_ku)

```
short stack_gaussian_fitting_residuals_20_ku(time_20_ku) ;
stack_gaussian_fitting_residuals_20_ku:_FillValue = -32768s ;
stack_gaussian_fitting_residuals_20_ku:add_offset = 0. ;
stack_gaussian_fitting_residuals_20_ku:comment = "Residuals of Gaussian that fits the range integrated power of the single look echoes within a stack. It is the root mean squared error between the Gaussian fitting and the range integrated power of the single look echoes within a stack. Applicable to SAR/SARIn only." ;
stack_gaussian_fitting_residuals_20_ku:coordinates = "lon_20_ku lat_20_ku";
stack_gaussian_fitting_residuals_20_ku:long_name = "gaussian power fitting: residuals fitting" ;
stack_gaussian_fitting_residuals_20_ku:scale_factor = 0.01 ;
stack_gaussian_fitting_residuals_20_ku:units = "dbW" ;
```

stack_kurtosis_20_ku(time_20_ku)

```
short stack_kurtosis_20_ku(time_20_ku) ;
stack_kurtosis_20_ku:_FillValue = -999s ;
stack_kurtosis_20_ku:units = "count" ;
stack_kurtosis_20_ku:long_name = "gaussian power fitting: kurtosis wrt beam number" ;
stack_kurtosis_20_ku:add_offset = 0. ;
stack_kurtosis_20_ku:scale_factor = 0.01 ;
stack_kurtosis_20_ku:comment = "4th central moment computed on the range integrated power of the single look echoes within a stack. Kurtosis as function of stack beam number. Applicable to SAR/SARIn only." ;
stack_kurtosis_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

stack_number_after_weighting_20_ku(time_20_ku)

```
short stack_number_after_weighting_20_ku(time_20_ku) ;
    stack_number_after_weighting_20_ku:_FillValue = -32768s ;
    stack_number_after_weighting_20_ku:units = "count" ;
    stack_number_after_weighting_20_ku:long_name = "number of contributing
                                beams in the stack after weighting" ;
    stack_number_after_weighting_20_ku:add_offset = 0s ;
    stack_number_after_weighting_20_ku:scale_factor = 1s ;
    stack_number_after_weighting_20_ku:comment = "Number of contributing
                                beams in the stack after weighting:
                                number of single look echoes in the
                                stack after the Surface Sample Stack
                                weighting is applied. Applicable to
                                SAR/SARIn only." ;
    stack_number_after_weighting_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

stack_number_before_weighting_20_ku(time_20_ku)

```
short stack_number_before_weighting_20_ku(time_20_ku) ;
    stack_number_before_weighting_20_ku:_FillValue = -32768s ;
    stack_number_before_weighting_20_ku:units = "count" ;
    stack_number_before_weighting_20_ku:long_name = "number of contributing
                                beams in the stack before weighting" ;
    stack_number_before_weighting_20_ku:add_offset = 0s ;
    stack_number_before_weighting_20_ku:scale_factor = 1s ;
    stack_number_before_weighting_20_ku:comment = "Number of contributing
                                beams in the stack before
                                weighting: number of single look
                                echoes in the stack before the
                                Surface Sample Stack weighting is
                                applied. Applicable to SAR/SARIn
                                only." ;
    stack_number_before_weighting_20_ku:coordinates = "lon_20_ku
                                lat_20_ku";
```

stack_peakiness_20_ku (time_20_ku)

```
short stack_peakiness_20_ku(time_20_ku) ;
stack_peakiness_20_ku:_FillValue = -32768s ;
stack_peakiness_20_ku:add_offset = 0.0 ;
stack_peakiness_20_ku:comment = "Stack peakiness computed from the
    range integrated power of the single look echoes within a stack.
    Stack peakiness is defined as the inverse of the average of the range
    integrated power normalized for the power at zero look angle.
    Applicable to SAR/SARIn only. See M. Passaro, F. L. Müller, D.
    Dettmering, Lead detection using Cryosat-2 delay-doppler processing
    and Sentinel-1 SAR images, In Advances in Space Research, 2017" ;
stack_peakiness_20_ku:coordinates = "lon_20_ku lat_20_ku";
stack_peakiness_20_ku:long_name = "Stack peakiness" ;
stack_peakiness_20_ku:scale_factor = 0.01 ;
stack_peakiness_20_ku:units = "count" ;
```

stack_scaled_amplitude_20_ku(time_20_ku)

```
short stack_scaled_amplitude_20_ku(time_20_ku) ;
stack_scaled_amplitude_20_ku:_FillValue = -32768s ;
stack_scaled_amplitude_20_ku:units = "dB" ;
stack_scaled_amplitude_20_ku:long_name = "gaussian power fitting:
    amplitude" ;
stack_scaled_amplitude_20_ku:add_offset = 0. ;
stack_scaled_amplitude_20_ku:scale_factor = 0.01 ;
stack_scaled_amplitude_20_ku:comment = "Amplitude of Gaussian that fits
    the range integrated power of the single look echoes within a stack.
    Applicable to SAR/SARIn only." ;
stack_scaled_amplitude_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

stack_skewness_20_ku(time_20_ku)

```
short stack_skewness_20_ku(time_20_ku) ;
    stack_skewness_20_ku:_FillValue = -999s ;
    stack_skewness_20_ku:units = "count" ;
    stack_skewness_20_ku:long_name = "gaussian power fitting: skewness wrt
                                      beam number" ;
    stack_skewness_20_ku:add_offset = 0.0 ;
    stack_skewness_20_ku:scale_factor = 0.01 ;
    stack_skewness_20_ku:comment = "3rd central moment computed on the range
                                   integrated power of the single look
                                   echoes within a stack. Skewness as
                                   function of stack beam number.
                                   Applicable to SAR/SARIn only."
                                   ;stack_skewness_20_ku:coordinates =
                                   "lon_20_ku lat_20_ku";
```

stack_std_20_ku(time_20_ku)

```
short stack_std_20_ku(time_20_ku) ;
    stack_std_20_ku:units = "count" ;
    stack_std_20_ku:_FillValue = -32768s ;
    stack_std_20_ku:long_name = "Gaussian power fitting: std dev wrt beam
                                 number" ;
    stack_std_20_ku:add_offset = 0. ;
    stack_std_20_ku:scale_factor = 0.01 ;
    stack_std_20_ku:comment = "Standard deviation of Gaussian that fits the
                               range integrated power of the single look
                               echoes within a stack. Standard deviation as
                               function of stack beam number. Applicable to
                               SAR/SARIn only." ;
    stack_std_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

stack_std_angle_20_ku(time_20_ku)

```
short stack_std_angle_20_ku(time_20_ku) ;
    stack_std_angle_20_ku:_FillValue = -32768s ;
```

```
stack_std_angle_20_ku:units = "rad" ;
stack_std_angle_20_ku:long_name = "gaussian power fitting: std dev wrt
                                   boresight angle" ;
stack_std_angle_20_ku:add_offset = 0. ;
stack_std_angle_20_ku:scale_factor = 1.e-06 ;
stack_std_angle_20_ku:comment = "Standard deviation of Gaussian that
                      fits the range integrated power of the single
                      look echoes within a stack. Standard deviation as
                      function of the boresight angle, that is the
                      angle between: (a) antenna boresight direction,
                      (b) direction from satellite to surface location.
                      The boresight angle depends on geometry and
                      attitude (roll and pitch). Applicable to
                      SAR/SARIn only." ;
stack_std_angle_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

stack_mask_start_stop_20_ku(time_20_ku, nlooks_ku) – SARin case

```
short stack_mask_start_stop_20_ku(time_20_ku, nlooks_ku) ;
        string stack_mask_start_stop_20_ku:long_name = "Zero-mask between
the start and stop looks within the stack" ;
        stack_mask_start_stop_20_ku:add_offset = 0.0 ;
        stack_mask_start_stop_20_ku:scale_factor = 1.0 ;
        string stack_mask_start_stop_20_ku = "lon_20_ku lat_20_ku" ;
        stack_mask_start_stop_20_ku:_FillValue = -32768s;
              string stack_mask_start_stop_20_ku:comment =
              "The zero-mask applied to the stack before
              multilooking. Each element of the mask refers to
              a look in the stack and indicates the index of
              the first of the last sample set to zero. The
              elements of the mask can assume four different
              values: (i) FillValue: all the samples in the
              look are equal to zero; (ii) 0: all the samples
```

```
in the look are different from zero; (iii)
positive value: index of the first sample equal
to zero; (iiii) negative value: opposite of index
of the first sample different from zero." ;
```

stack_mask_start_stop_20_ku(time_20_ku, nlooks_ku) – SAR case

```
byte stack_mask_start_stop_20_ku(time_20_ku, nlooks_ku) ;
        string stack_mask_start_stop_20_ku:long_name = "Zero-mask between the start and stop looks within the stack" ;
        stack_mask_start_stop_20_ku:add_offset = 2.0 ;
        stack_mask_start_stop_20_ku:scale_factor = 2.0 ;
        string stack_mask_start_stop_20_ku = "lon_20_ku lat_20_ku" ;
        stack_mask_start_stop_20_ku:_FillValue = -128b;
        string stack_mask_start_stop_20_ku:comment = "The zero-mask applied to the stack before multilooking. Each element of the mask refers to a look in the stack and indicates the index of the first of the last sample set to zero. The elements of the mask can assume four different values: (i) FillValue: all the samples in the look are equal to zero; (ii) 0: all the samples in the look are different from zero; (iii) positive value: index of the first sample equal to zero; (iiii) negative value: opposite of index of the first sample different from zero."
```

surf_type_01(time_cor_01)

```
byte surf_type_01(time_cor_01) ;
    surf_type_01:_FillValue = -128b ;
    surf_type_01:long_name = “surface type flag” ;
    surf_type_01:flag_values = 0b, 1b, 2b, 3b ;
    surf_type_01:flag_meanings = “ocean lake_enclosed_sea ice land” ;
    surf_type_01:source = “GMT, GlobCover, Modis Mosaic of Antarctica, and Water body outlines from LEGOS”;
    surf_type_01 :institution = « CLS/CNES » ;
    surf_type_01:comment = “A 4-state surface type mask for Cryosat2 data for the surface type at the nadir location. Computed by combining data from different sources: GMT, GlobCover, Modis Mosaic of Antarctica, and Water body outlines from LEGOS. “ ;
    surf_type_01:coordinates = “lat_cor_01 lon_cor_01”;
```

time_20_ku(time_20_ku)

```
double time_20_ku(time_20_ku) ;
    time_20_ku:units = "seconds since 2000-01-01 00:00:00.0" ;
    time_20_ku:long_name = "time in TAI: seconds since 1 Jan 2000" ;
    time_20_ku:standard_name = "time" ;
    time_20_ku:calendar = "175regorian" ;
    time_20_ku:comment = "TAI time counted in seconds since 2000-01-01
                         00:00:00. Time refers to the instant the L1B
                         20Hz power waveform touches the surface." ;
    time_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

time_21_ku(time_21_ku)

```
double time_21_ku(time_21_ku) ;
    time_21_ku:units = "seconds since 2000-01-01 00:00:00.0" ;
    time_21_ku:long_name = "time in TAI: seconds since 1 Jan 2000" ;
    time_21_ku:standard_name = "time" ;
    time_21_ku:calendar = "176regorian" ;
    time_21_ku:comment = "TAI time counted in seconds since 2000-01-01
                          00:00:00. Time corresponding to ground bounce
                          time of the middle of the burst - FBR SARIn."
                          ;
    time_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

time_85_ku(time_85_ku)

```
double time_85_ku(time_85_ku)) ;
    time_85_ku:units = "seconds since 2000-01-01 00:00:00.0" ;
    time_85_ku:long_name = "time in TAI: seconds since 1 Jan 2000" ;
    time_85_ku:standard_name = "time" ;
    time_85_ku:calendar = "176regorian" ;
    time_85_ku:comment = "TAI time counted in seconds since 2000-01-01
                          00:00:00. Time corresponding to ground bounce
                          time of the middle of the burst - FBR SAR." ;
    time_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

time_avg_01_ku(time_avg_01_ku)

```
double time_avg_01_ku(time_avg_01_ku) ;
    time_avg_01_ku:units = "seconds since 2000-01-01 00:00:00.0" ;
    time_avg_01_ku:calendar = "gregorian" ;
    time_avg_01_ku:long_name = "time in TAI: seconds since 1 Jan 2000" ;
    time_avg_01_ku:standard_name = "time" ;
    time_avg_01_ku:comment = "TAI time counted in seconds since 2000-01-01
                          00:00:00. Time refers to the instant the L1B
                          1Hz average power waveform touches the
                          surface." ;
    time_avg_01_ku:coordinates = "lat_avg_01_ku lon_20_avg_01_ku";
```

time_plrm_01_ku(time_plrm_01_ku)

```
double time_plrm_01_ku(time_plrm_01_ku) ;
    time_plrm_01_ku:units = "seconds since 2000-01-01 00:00:00.0" ;
    time_plrm_01_ku:calendar = "gregorian" ;
    time_plrm_01_ku:long_name = "time in TAI: seconds since 1 Jan 2000" ;
    time_plrm_01_ku:standard_name = "time" ;
    time_plrm_01_ku:comment = "TAI time counted in seconds since 2000-01-01
                              00:00:00. Time refers to the instant the L1B
                              1Hz average power waveform touches the
                              surface." ;
    time_plrm_01_ku:coordinates = "lat_plrm_01_ku lon_plrm_01_ku";
```

time_plrm_20_ku(time_plrm_20_ku)

```
double time_plrm_20_ku(time_plrm_20_ku) ;
    time_plrm_20_ku:units = "seconds since 2000-01-01 00:00:00.0" ;
    time_plrm_20_ku:calendar = "177regorian" ;
    time_plrm_20_ku:long_name = "time in TAI: seconds since 1 Jan 2000" ;
    time_plrm_20_ku:standard_name = "time" ;
    time_plrm_20_ku:comment = "TAI time counted in seconds since 2000-01-01
                              00:00:00. Time refers to the instant the L1B
                              20Hz average power waveform touches the
                              surface." ;
    time_plrm_20_ku:coordinates = "lat_plrm_20_ku lon_plrm_20_ku";
```

time_cor_01(time_cor_01)

```
double time_cor_01(time_cor_01)) ;
    time_cor_01:units = "seconds since 2000-01-01 00:00:00.0" ;
    time_cor_01:long_name = "time in TAI: seconds since 1 Jan 2000" ;
    time_cor_01:standard_name = "time" ;
    time_cor_01:calendar = "178regorian" ;
    time_cor_01:comment = "TAI time counted in seconds since 2000-01-01
                          00:00:00. Time refers to the instant which
                          the corrections are referred to." ;
               time_cor_01:coordinates = "lat_cor_01 lon_cor_01";
```

tot_gain_ch1_20_ku(time_20_ku)

```
int tot_gain_ch1_20_ku(time_20_ku) ;
    tot_gain_ch1_20_ku:_FillValue = -2147483648 ;
    tot_gain_ch1_20_ku:units = "dB" ;
    tot_gain_ch1_20_ku:long_name = "total fixed gain on channel 1" ;
    tot_gain_ch1_20_ku:add_offset = 0. ;
    tot_gain_ch1_20_ku:scale_factor = 0.01 ;
    tot_gain_ch1_20_ku:comment = "Total Fixed Gain On Channel 1 - total
                                 fixed instrument gain applied on channel 1,
                                 this is the gain applied by the RF unit.
                                 Applied in L1B." ;
    tot_gain_ch1_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

tot_gain_ch1_21_ku(time_21_ku)

```
int tot_gain_ch1_21_ku(time_21_ku) ;
    tot_gain_ch1_21_ku:_FillValue = -2147483648 ;
    tot_gain_ch1_21_ku:units = "dB" ;
    tot_gain_ch1_21_ku:long_name = "total fixed gain on channel 1" ;
    tot_gain_ch1_21_ku:add_offset = 0. ;
    tot_gain_ch1_21_ku:scale_factor = 0.01 ;
    tot_gain_ch1_21_ku:comment = "Total Fixed Gain On Channel 1 - total
                                 fixed instrument gain to be applied on
```

```
                    channel 1, this is the gain applied by the
                    RF unit- FBR SARIn." ;
tot_gain_ch1_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

tot_gain_ch1_85_ku(time_85_ku)

```
int tot_gain_ch1_85_ku(time_85_ku) ;
    tot_gain_ch1_85_ku:_FillValue = -2147483648 ;
    tot_gain_ch1_85_ku:units = "dB" ;
    tot_gain_ch1_85_ku:long_name = "total fixed gain on channel 1" ;
    tot_gain_ch1_85_ku:add_offset = 0. ;
    tot_gain_ch1_85_ku:scale_factor = 0.01 ;
    tot_gain_ch1_85_ku:comment = "Total Fixed Gain On Channel 1 - total
                                fixed instrument gain to be applied on
                                channel 1, this is the gain applied by the
                                RF unit - FBR SAR." ;
    tot_gain_ch1_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

tot_gain_ch2_20_ku(time_20_ku)

```
int  tot_gain_ch2_20_ku(time_20_ku) ;
    tot_gain_ch2_20_ku:_FillValue = -2147483648 ;
    tot_gain_ch2_20_ku:units = "dB" ;
    tot_gain_ch2_20_ku:long_name = "total fixed gain on channel 2" ;
    tot_gain_ch2_20_ku:add_offset = 0. ;
    tot_gain_ch2_20_ku:scale_factor = 0.01 ;
    tot_gain_ch2_20_ku:comment = "Total Fixed Gain On Channel 2 - total
                                fixed instrument gain applied on channel 2,
                                this is the gain applied by the RF unit.
                                Applied in L1B." ;
    tot_gain_ch2_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

tot_gain_ch2_21_ku(time_21_ku)

```
int tot_gain_ch2_21_ku(time_21_ku) ;
    tot_gain_ch2_21_ku:_FillValue = -2147483648 ;
    tot_gain_ch2_21_ku:units = "dB" ;
    tot_gain_ch2_21_ku:long_name = "total fixed gain on channel 2" ;
    tot_gain_ch2_21_ku:add_offset = 0. ;
    tot_gain_ch2_21_ku:scale_factor = 0.01 ;
    tot_gain_ch2_21_ku:comment = "Total Fixed Gain On Channel 2 - total
                            fixed instrument gain to be applied on
                            channel 2, this is the gain applied by the
                            RF unit - FBR SARIn." ;
    tot_gain_ch2_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

tot_gain_ch2_85_ku(time_85_ku)

```
int tot_gain_ch2_85_ku(time_85_ku) ;
    tot_gain_ch2_85_ku:_FillValue = -2147483648 ;
    tot_gain_ch2_85_ku:units = "dB" ;
    tot_gain_ch2_85_ku:long_name = "total fixed gain on channel 2" ;
    tot_gain_ch2_85_ku:add_offset = 0. ;
    tot_gain_ch2_85_ku:scale_factor = 0.01 ;
    tot_gain_ch2_85_ku:comment = "Total Fixed Gain On Channel 2 - total
                            fixed instrument gain to be applied on
                            channel 2, this is the gain applied by the
                            RF unit - FBR SAR." ;
    tot_gain_ch2_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

transmit_pwr_20_ku(time_20_ku)

```
int  transmit_pwr_20_ku(time_20_ku) ;
    transmit_pwr_20_ku:_FillValue = -2147483648 ;
    transmit_pwr_20_ku:units = "Watt" ;
    transmit_pwr_20_ku:long_name = "transmitted power" ;
    transmit_pwr_20_ku:add_offset = 0. ;
    transmit_pwr_20_ku:scale_factor = 1.e-06 ;
    transmit_pwr_20_ku:comment = "The altimeter transmit power." ;
```

```
transmit_pwr_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

transmit_pwr_21_ku(time_21_ku)

```
int  transmit_pwr_21_ku(time_21_ku) ;
    transmit_pwr_21_ku:_FillValue = -2147483648 ;
    transmit_pwr_21_ku:units = "Watt" ;
    transmit_pwr_21_ku:long_name = "transmitted power" ;
    transmit_pwr_21_ku:add_offset = 0. ;
    transmit_pwr_21_ku:scale_factor = 1.e-06 ;
    transmit_pwr_21_ku:comment = "The altimeter transmit power - FBR SARIn."
    Transmit_pwr_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

transmit_pwr_85_ku(time_85_ku)

```
int  transmit_pwr_85_ku(time_85_ku) ;
    transmit_pwr_85_ku:_FillValue = -2147483648 ;
    transmit_pwr_85_ku:units = "Watt" ;
    transmit_pwr_85_ku:long_name = "transmitted power" ;
    transmit_pwr_85_ku:add_offset = 0. ;
    transmit_pwr_85_ku:scale_factor = 1.e-06 ;
    transmit_pwr_85_ku:comment = "The altimeter transmit power - FBR SAR.";
    transmit_pwr_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

uso_cor_20_ku(time_20_ku)

```
int uso_cor_20_ku(time_20_ku) ;
uso_cor_20_ku:_FillValue = 2147483647 ;
uso_cor_20_ku:add_offset = 0. ;
uso_cor_20_ku:comment = "USO correction defined as the additive correction to window delay referred to L1B 20Hz average waveform. This correction has been applied. This correction accounts for the difference between the nominal frequency provided in the IPFDB and the modelled frequency deviation provided by the DORIS USO drift file." ;
uso_cor_20_ku:coordinates = "lon_20_ku lat_20_ku";
uso_cor_20_ku:long_name = "uso correction applied to window delay (2-way)" ;
uso_cor_20_ku:scale_factor = 1.e-12 ;
    uso_cor_20_ku:units = "seconds" ;
```

uso_cor_avg_01_ku(time_avg_01_ku)

```
int uso_cor_avg_01_ku(time_avg_01_ku) ;
uso_cor_avg_01_ku:_FillValue = 2147483647 ;
uso_cor_avg_01_ku:add_offset = 0. ;
uso_cor_avg_01_ku:comment = "USO correction defined as the additive
                correction to window delay referred to L1B
                1Hz average power waveform. This correction
                has been applied. This correction accounts
                for the difference between the nominal
                frequency provided in the IPFDB and the
                modelled frequency deviation provided by the
                DORIS USO drift file." ;
uso_cor_avg_01_ku:coordinates = "lon_avg_01_ku lat_avg_01_ku";
uso_cor_avg_01_ku:long_name = "uso correction applied to window delay
                (2-way)" ;
uso_cor_avg_01_ku:scale_factor = 1.e-12 ;
uso_cor_avg_01_ku:units = "seconds" ;
```

uso_cor_plrm_01_ku(time_plrm_01_ku)

```
int uso_cor_plrm_01_ku(time_plrm_01_ku) ;
uso_cor_plrm_01_ku:_FillValue = 2147483647 ;
uso_cor_plrm_01_ku:add_offset = 0. ;
uso_cor_plrm_01_ku:comment = "USO correction defined as the additive
                correction to window delay referred to L1B
                1Hz average power waveform. This correction
                has been applied. This correction accounts
                for the difference between the nominal
                frequency provided in the IPFDB and the
                modelled frequency deviation provided by the
                DORIS USO drift file." ;
uso_cor_plrm_01_ku:coordinates = "lon_plrm_01_ku lat_plrm_01_ku";
uso_cor_plrm_01_ku:long_name = "uso correction applied to window delay
                (2-way)" ;
uso_cor_plrm_01_ku:scale_factor = 1.e-12 ;
uso_cor_plrm_01_ku:units = "seconds" ;
```

uso_cor_plrm_20_ku(time_plrm_20_ku)

```
int uso_cor_plrm_20_ku(time_plrm_20_ku) ;
uso_cor_plrm_20_ku:_FillValue = 2147483647 ;
uso_cor_plrm_20_ku:add_offset = 0. ;
uso_cor_plrm_20_ku:comment = "USO correction defined as the additive
                     correction to window delay referred to L1B
                     1Hz average power waveform. This correction
                     has been applied. This correction accounts
                     for the difference between the nominal
                     frequency provided in the IPFDB and the
                     modelled frequency deviation provided by the
                     DORIS USO drift file." ;
uso_cor_plrm_20_ku:coordinates = "lon_plrm_20_ku lat_plrm_20_ku";
uso_cor_plrm_20_ku:long_name = "uso correction applied to window delay
                     (2-way)" ;
uso_cor_plrm_20_ku:scale_factor = 1.e-12 ;
uso_cor_plrm_20_ku:units = "seconds" ;
```

uso_cor_21_ku(time_21_ku)

```
int  uso_cor_21_ku(time_21_ku) ;
uso_cor_21_ku:_FillValue = 2147483647 ;
uso_cor_21_ku:long_name = "uso correction (2-way)" ;
uso_cor_21_ku:add_offset = 0. ;
uso_cor_21_ku:scale_factor = 1.e-12 ;
uso_cor_21_ku:comment = "USO correction factor defined as the ratio
                     between the nominal and the modelled value.
                     This correction accounts for the difference
                     between the nominal frequency provided in the
                     IPFDB and the modelled frequency deviation
                     provided by the DORIS USO drift file.
```

```
                        Correction to be applied by the user – FBR
                        SARIn." ;
uso_cor_20_ku:units = "seconds" ;
uso_cor_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

uso_cor_85_ku(time_85_ku)

```
int  uso_cor_85_ku(time_85_ku) ;
    uso_cor_85_ku:_FillValue = 2147483647 ;
    uso_cor_85_ku:long_name = "uso correction (2-way)" ;
    uso_cor_85_ku:add_offset = 0. ;
    uso_cor_85_ku:scale_factor = 1.e-12 ;
    uso_cor_85_ku:comment = "USO correction factor defined as the ratio
                             between the nominal and the modelled value.
                             This correction accounts for the difference
                             between the nominal frequency provided in the
                             IPFDB and the modelled frequency deviation
                             provided by the DORIS USO drift file.
                             Correction to be applied by the user - FBR
                             SAR." ;uso_cor_85_ku:units = "seconds" ;
    uso_cor_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

window_del_20_ku(time_20_ku)

```
int64 window_del_20_ku(time_20_ku) ;
    window_del_20_ku:_FillValue = -9223372036854775808L ;
    window_del_20_ku:units = "seconds" ;
    window_del_20_ku:long_name = "calibrated window delay (2-way)" ;
    window_del_20_ku:add_offset = 0.0 ;
    window_del_20_ku:scale_factor = 1.e-12 ;
    window_del_20_ku:comment = "Calibrated 2-way window delay: distance
          from CoM to middle range window (at sample ns/2 from 0). It
          includes the USO correction and all the range corrections
          given in the variable instr_cor_range_tx_rx for all the modes
          and in the variable instr_cor_range_rx for SARIn only. This
          is a 2-way time and 2-way corrections are applied." ;
    window_del_20_ku:coordinates = "lon_20_ku lat_20_ku";
```

window_del_21_ku(time_21_ku)

```
int64 window_del_21_ku(time_21_ku) ;
    window_del_21_ku:_FillValue = -9223372036854775808L ;
    window_del_21_ku:units = "seconds" ;
    window_del_21_ku:long_name = "window delay (2-way)" ;
    window_del_21_ku:add_offset = 0.0 ;
    window_del_21_ku:scale_factor = 1.e-12 ;
    window_del_21_ku:comment = "2-way window: distance from CoM to middle
          range window (at sample ns/2 from 0). It does not include
          range corrections, which are given in the variable
          instr_cor_range_tx_rx for channel 1 and in the variable
          instr_cor_range_rx for channel 2 - FBR SARIn."
          ;window_del_21_ku:coordinates = "lon_21_ku lat_21_ku";
```

window_del_85_ku(time_85_ku)

```
int64 window_del_85_ku(time_85_ku) ;
    window_del_85_ku:_FillValue = -9223372036854775808L ;
    window_del_85_ku:units = "seconds" ;
    window_del_85_ku:long_name = "window delay (2-way)" ;
    window_del_85_ku:add_offset = 0.0 ;
    window_del_85_ku:scale_factor = 1.e-12 ;
    window_del_85_ku:comment = "2-way window delay: distance from CoM to
                         middle range window (at sample ns/2 from 0).
                         It does not include range corrections, which
                         are given in the variable
                         instr_cor_range_tx_rx - FBR SAR." ;
    window_del_85_ku:coordinates = "lon_85_ku lat_85_ku";
```

window_del_avg_01_ku(time_avg_01_ku)

```
int64 window_del_avg_01_ku(time_avg_01_ku) ;
    window_del_avg_01_ku:_FillValue = -9223372036854775808L ;
    window_del_avg_01_ku:units = "seconds" ;
    window_del_avg_01_ku:long_name = "calibrated window delay (2-way)" ;
    window_del_avg_01_ku:add_offset = 0.d ;
    window_del_avg_01_ku:scale_factor = 1.e-12d ;
    string window_del_avg_01_ku:comment = "Calibrated 2-way window delay:
                    distance from CoM to middle range window (at
                    sample ns/2 from 0). It includes the USO
                    correction and all range corrections given in
                    the variable instr_cor_range_tx_rx for all
                    the modes and in the variable
                    instr_cor_range_rx for SARIn only. This is a
                    2-way time and 2-way corrections are
                    applied." ;
    window_del_avg_01_ku:coordinates = "lon_avg_01_ku lat_avg_01_ku";
```

window_del_plrm_01_ku(time_plrm_01_ku)

```
int64 window_del_plrm_01_ku(time_plrm_01_ku) ;
    window_del_plrm_01_ku:_FillValue = -9223372036854775808L ;
    window_del_plrm_01_ku:units = "seconds" ;
    window_del_plrm_01_ku:long_name = "calibrated window delay (2-way)" ;
    window_del_plrm_01_ku:add_offset = 0.d ;
    window_del_plrm_01_ku:scale_factor = 1.e-12d ;
    string window_del_plrm_01_ku:comment = "Calibrated 2-way window delay:
                    distance from CoM to middle range window (at
                    sample ns/2 from 0). It includes the USO
                    correction and all range corrections given in
                    the variable instr_cor_range_tx_rx for all
                    the modes and in the variable
                    instr_cor_range_rx for SARIn only. This is a
                    2-way time and 2-way corrections are
                    applied." ;
    window_del_plrm_01_ku:coordinates = "lon_plrm_01_ku lat_plrm_01_ku";
```

window_del_plrm_20_ku(time_plrm_20_ku)

```
int64 window_del_plrm_20_ku(time_plrm_20_ku) ;
    window_del_plrm_20_ku:_FillValue = -9223372036854775808L ;
    window_del_plrm_20_ku:units = "seconds" ;
    window_del_plrm_20_ku:long_name = "calibrated window delay (2-way)" ;
    window_del_plrm_20_ku:add_offset = 0.d ;
    window_del_plrm_20_ku:scale_factor = 1.e-12d ;
    string window_del_plrm_20_ku:comment = "Calibrated 2-way window delay:
                            distance from CoM to middle range window (at
                            sample ns/2 from 0). It includes the USO
                            correction and all range corrections given in
                            the variable instr_cor_range_tx_rx for all
                            the modes and in the variable
                            instr_cor_range_rx for SARIn only. This is a
                            2-way time and 2-way corrections are
                            applied." ;
    window_del_plrm_20_ku:coordinates = "lon_plrm_20_ku lat_plrm_20_ku";
```

doppler_angle_ku(time_20_ku,nlooks_ku)

```
short doppler_angle_ku(time_20_ku,nlooks_ku)
    doppler_angle_ku:comment = "It is the angle between: (a)
  direction normal to the velocity vector, (b) direction
  satellite - surface location. The Doppler angle depends on
  velocity vector and on geometry";
    doppler_angle_ku:coordinates = "lon_20_ku lat_20_ku";
    doppler_angle_ku:long_name = "Doppler angle associated
  to the single look waveform (Ku-band)";
    doppler_angle_ku:units = „rad";
    doppler_angle_ku:_FillValue = -32768s;
    doppler_angle_ku:scale_factor = 1.0e-6;
```

doppler_range_correction_ku(time_20_ku,nlooks_ku)

```
int doppler_range_correction_ku(time_20_ku,nlooks_ku)
```

doppler_range_correction_ku:comment = "Doppler correction applied to the single look waveform";

doppler_range_correction_ku:coordinates = "lon_20_ku lat_20_ku";

doppler_range_correction_ku:long_name = "Doppler correction applied to the single look waveform (Ku-band)";

doppler_range_correction_ku:units = "m";

doppler_range_correction_ku:_FillValue = -2147483648;

doppler_range_correction_ku:scale_factor = 0.001;

iq_scale_factor_ch1_ku(time_20_ku,nlooks_ku)

float iq_scale_factor_ch1_ku(time_20_ku,nlooks_ku)

iq_scale_factor_ch1_ku:comment = "The scaling factor in order to convert the I and Q samples from count to V for Tx-Rx channel. Note that the same scaling factor applies to both I and Q samples. The scaling is applied as follows: sl_waveform_ch1_[iq]_ku_V(time_20_ku, nlooks_ku, ns_20_ku) = sl_waveform_ch1_[iq]_ku(time_20_ku, nlooks_ku, ns_20_ku)* iq_scale_factor_ch1_ku(time_20_ku, nlooks_ku)";

iq_scale_factor_ch1_ku:coordinates = "lon_20_ku lat_20_ku";

iq_scale_factor_ch1_ku:long_name = "I and Q scale factor, to convert I and Q samples from [-127, +127] to amplitude at antenna flange (Ku-band). Tx-Rx channel.";

iq_scale_factor_ch1_ku:units = "V";

iq_scale_factor_ch1_ku:_FillValue = NaNf;

iq_scale_factor_ch2_ku(time_20_ku,nlooks_ku)

float iq_scale_factor_ch2_ku(time_20_ku,nlooks_ku)

iq_scale_factor_ch2_ku:comment = "The scaling factor in order to convert the I and Q samples from count to V for

Rx only channel. Note that the same scaling factor applies to both I and Q samples. The scaling is applied as follows: sl_waveform_ch2_[iq]_ku_V(time_20_ku, nlooks_ku, ns_20_ku) = sl_waveform_ch2_[iq]_ku(time_20_ku, nlooks_ku, ns_20_ku)* iq_scale_factor_ch2_ku(time_20_ku, nlooks_ku)";

iq_scale_factor_ch2_ku:coordinates = "lon_20_ku lat_20_ku";

iq_scale_factor_ch2_ku:long_name = "I and Q scale factor, to convert I and Q samples from [-127, +127] to amplitude at antenna flange (Ku-band). Rx only channel.";

iq_scale_factor_ch2_ku:units = "V";

iq_scale_factor_ch2_ku:_FillValue = NaNf;

look_angle_ku(time_20_ku,nlooks_ku)

short look_angle_ku(time_20_ku,nlooks_ku)

look_angle_ku:comment = "It is the angle between: (a) perpendicular from the satellite CoM to the surface, (b) direction satellite - surface location. The look angle depends purely on geometry";

look_angle_ku:coordinates = "lon_20_ku lat_20_ku";

look_angle_ku:long_name = "Look angle associated to the single look waveform (Ku-band)";

look_angle_ku:units = "rad";

look_angle_ku:_FillValue = -32768s;

look_angle_ku:scale_factor = 1.0e-6;

sl_waveform_ch1_i_ku(time_20_ku, nlooks_ku,ns_20_ku)

byte sl_waveform_ch1_i_ku(time_20_ku, nlooks_ku,ns_20_ku)

sl_waveform_ch1_i_ku:comment = "The in-phase component of each L1B-S single look waveform for Tx-Rx channel. Each look is a fully calibrated, high resolution complex waveform. Each look within the stack is: (a) given in the time domain, (b) aligned within the stack (slant range, Doppler range, window delay misalignments corrections applied), (c) fully calibrated. A final scaling, given in the variable iq_scale_factor_ch1_ku, is applied in order to best fit the i-component into 1 byte";

sl_waveform_ch1_i_ku:coordinates = "lon_20_ku lat_20_ku";

sl_waveform_ch1_i_ku:long_name = "I-samples for L1B-S single look waveforms for Tx-Rx channel, arranged in stacks of looks x samples elements. I-samples are scaled to range [-127, +127] (Ku-band)";

sl_waveform_ch1_i_ku:units = "count";

sl_waveform_ch1_i_ku:_FillValue = -128b;

sl_waveform_ch1_q_ku(time_20_ku, nlooks_ku,ns_20_ku)

byte sl_waveform_ch1_q_ku(time_20_ku, nlooks_ku,ns_20_ku)

sl_waveform_ch1_q_ku:comment = "The quadrature component of each L1B-S single look waveform for Tx-Rx channel. Each look is a fully calibrated, high resolution complex waveform. Each look within the stack is: (a) given in the time domain, (b) aligned within the stack (slant range, Doppler range, window delay misalignments corrections applied), (c) fully calibrated. A final scaling, given in the variable iq_scale_factor_ch1_ku, is applied in order to best fit the q-component into 1 byte";

sl_waveform_ch1_q_ku:coordinates = "lon_20_ku lat_20_ku";

sl_waveform_ch1_q_ku:long_name = "Q-samples for L1B-S single look waveforms for Tx-Rx channel, arranged in stacks of looks x samples elements. Q-samples are scaled to range [-127, +127] (Ku-band)";

sl_waveform_ch1_q_ku:units = "count";

sl_waveform_ch1_q_ku:_FillValue = -128b;

sl_waveform_ch2_i_ku(time_20_ku, nlooks_ku,ns_20_ku)

byte sl_waveform_ch2_i_ku(time_20_ku, nlooks_ku,ns_20_ku)

sl_waveform_ch2_i_ku:comment = "The in-phase component of each L1B-S single look waveform for Rx only channel. Each look is a fully calibrated, high resolution complex waveform. Each look within the stack is: (a) given in the time domain, (b) aligned within the stack (slant range, Doppler range, window delay misalignments corrections applied), (c) fully calibrated. A final scaling, given in the variable iq_scale_factor_ch2_ku, is applied in order to best fit the i-component into 1 byte";

sl_waveform_ch2_i_ku:coordinates = "lon_20_ku lat_20_ku";

sl_waveform_ch2_i_ku:long_name = "I-samples for L1B-S single look waveforms for Rx only channel, arranged in stacks of looks x samples elements. I-samples are scaled to range [-127, +127] (Ku-band)";

sl_waveform_ch2_i_ku:units = "count";

sl_waveform_ch2_i_ku:_FillValue = -128b;

sl_waveform_ch2_q_ku(time_20_ku, nlooks_ku,ns_20_ku)

byte sl_waveform_ch2_q_ku(time_20_ku, nlooks_ku,ns_20_ku)

sl_waveform_ch2_q_ku:comment = "The quadrature component of each L1B-S single look waveform for Rx only channel. Each look is a fully calibrated, high resolution complex waveform. Each look within the stack is: (a) given in the time domain, (b) aligned within the stack (slant range, Doppler range, window delay misalignments corrections applied), (c) fully calibrated. A final scaling, given in the variable iq_scale_factor_ch2_ku, is applied in order to best fit the q-component into 1 byte";

sl_waveform_ch2_q_ku:coordinates = "lon_20_ku lat_20_ku";

sl_waveform_ch2_q_ku:long_name = "Q-samples for L1B-S single look waveforms for Rx only channel, arranged in stacks of looks x samples elements. Q-samples are scaled to range [-127, +127] (Ku-band)";

sl_waveform_ch2_q_ku:units = "count";

sl_waveform_ch2_q_ku:_FillValue = -128b;

sl_time_ku(time_20_ku,nlooks_ku)

double sl_time_ku(time_20_ku,nlooks_ku)

sl_time_ku:calendar = "195regorian";

sl_time_ku:comment = " TAI time counted in seconds since 2000-01-01 00:00:00. Single look waveform time stamp.";

sl_time_ku:coordinates = "lon_20_ku lat_20_ku";

sl_time_ku:long_name = " time in TAI: seconds since 1 Jan 2000";

sl_time_ku:standard_name = "time";

sl_time_ku:units = " seconds since 2000-01-01 00:00:00.0";

pointing_angle_ku(time_20_ku,nlooks_ku)

short pointing_angle_ku(time_20_ku,nlooks_ku)

pointing_angle_ku:comment = "It is the angle between: (a) antenna boresight direction, (b) direction satellite - surface location. The pointing angle depends on geometry and attitude (roll and pitch)";

pointing_angle_ku:coordinates = "lon_20_ku lat_20_ku";

```
pointing_angle_ku:long_name = "Pointing angle associated to the single look waveform (Ku-band)";
pointing_angle_ku:units = "rad";
pointing_angle_ku:_FillValue = -32768s;
pointing_angle_ku:scale_factor = 1.0e-6;
```

slant_range_correction_ku(time_20_ku,nlooks_ku)

```
int slant_range_correction_ku(time_20_ku,nlooks_ku)
    slant_range_correction_ku:comment = "Slant range correction applied to the single look waveform";
    slant_range_correction_ku:coordinates = "lon_20_ku lat_20_ku";
    slant_range_correction_ku:long_name = "Slant range correction applied to the single look waveform (Ku-band)";
    slant_range_correction_ku:units = "m";
    slant_range_correction_ku:_FillValue = -2147483648;
    slant_range_correction_ku:scale_factor = 0.001;
```

sl_counter_ku(time_20_ku,nlooks_ku)

```
int sl_counter_ku(time_20_ku,nlooks_ku)
    sl_counter_ku:comment = "Look identification. It is the burst number from which the single look waveform is computed.";
    sl_counter_ku:coordinates = "lon_20_ku lat_20_ku";
    sl_counter_ku:long_name = "Burst number";
    sl_counter_ku:units = "count";
    sl_counter_ku:_FillValue = -2147483648;
```

3.5 FLAG MEANING TABLES

3.5.1 flag_cor_err_01 flag meaning:

ID	Flag Name	Definition	Setting
1.	model_dry_error	Dry Tropospheric Correction Error	0 = OK, 1 = error
2.	model_wet_error	Wet Tropospheric Correction Error	0 = OK, 1 = error
3.	inv_bar_error	Inverse Barometric Correction Error	0 = OK, 1 = error
4.	hf_fluctuations_error	Dynamic Atmospheric Correction Error	0 = OK, 1 = error
5.	iono_gim_error	GIM Ionospheric Correction Error	0 = OK, 1 = error
6.	iono_model_error	Model Ionospheric Correction Error	0 = OK, 1 = error
7.	ocean_tide_error	Ocean Equilibrium Tide Error	0 = OK, 1 = error
8.	ocean_tide_equil_error	Ocean Long Period Tide Error	0 = OK, 1 = error
9.	load_tide_error	Ocean Loading Tide Error	0 = OK, 1 = error
10.	solid_earth_error	Solid Earth Tide Error	0 = OK, 1 = error
11.	pole_tide_error	Geocentric Polar Tide Error	0 = OK, 1 = error
12.	surface_type_error	Surface type flag Error	0 = OK, 1 = error

3.5.2 flag_cor_status_01 flag meaning:

ID	Flag Name	Definition	Setting
1.	model_dry_called	Dry Tropospheric Correction Called	0 = no, 1 = yes
2.	model_wet_called	Wet Tropospheric Correction Called	0 = no, 1 = yes
3.	inv_bar_called	Inverse Barometric Correction Called	0 = no, 1 = yes
4.	hf_fluctuations_called	Dynamic Atmospheric Correction Called	0 = no, 1 = yes
5.	iono_gim_called	GIM Ionospheric Correction Called	0 = no, 1 = yes
6.	iono_model_called	Model Ionospheric Correction Called	0 = no, 1 = yes

7.	ocean_tide_called	Ocean Equilibrium Tide Called	0 = no, 1 = yes
8.	ocean_tide_equil_called	Ocean Long Period Tide Called	0 = no, 1 = yes
9.	load_tide_called	Ocean Loading Tide Called	0 = no, 1 = yes
10.	solid_earth_called	Solid Earth Tide Called	0 = no, 1 = yes
11.	pole_tide_called	Geocentric Polar Tide Called	0 = no, 1 = yes
12.	surface_type_called	Surface type flag Called	0 = no, 1 = yes

3.5.3 flag_echo_20_ku flag meaning:

ID	Flag name	Definition	Setting
1	approx_beam_steering	Approximate beam steering	0 = no, 1 = approximate steering used
2	exact_beam_steering	Exact beam steering	0 = no, 1 = exact steering used
3	doppler_weighting_computed	Doppler weighting computed	0 = not computed, 1 = computed
4	doppler_weighting_applied	Doppler weighting applied before stack	0 = not applied, 1 = applied
5	multi_look_incomplete	Multi look incomplete	0 = no (i.e. complete), 1 = incomplete
6	beam_angle_steering_error	Beam angle steering error	0 = OK, 1 = error
7	anti_aliased_power_echoes	Anti aliased power echoes	0 = no, 1 = anti aliased
8	auto_beam_steering	Auto beam steering	0 = no, 1 = auto beam steering used. Beam steering method is chosen based on the on-board tracker height variation.

3.5.4 flag_echo_avg_01_ku, flag_echo_plrm_01_ku and flag_echo_plrm_20_ku flag meaning:

ID	Flag Name	Definition	Setting
1.	1_hz_echo_error_not_computed	1 Hz Echo Error	0 = 1Hz Echo Computed 1 = 1Hz Echo Not Computed
2.	plrm_echo_error_not_computed	plrm Hz Echo Error	0 =plrm Echo Computed 1 = plrm Echo Not Computed
3.	mispointing_bad_angles	Mispointing error	1=bad angles 0=no error

3.5.5 flag_instr_conf_rx_flags_20_ku flag meaning:

ID	Flag Name	Definition	Setting
1.	siral_redundant	SIRAL_Identifier	0 = Nominal 1 = Redundant
2.	external_cal	External Calibration	0 = no 1 = External Calibration
3.	open_loop	Loop Status	0 = closed loop 1 = open loop
4.	loss_of_echo	Loss of Echo (from Cycle Report)	0 = OK 1 = Loss of Echo
5.	real_time_error	Real Time Error (from Cycle Report)	0 = OK 1 = Real Time Computation Error
6.	echo_saturation	Echo Saturation Error (from Cycle Report)	0 = OK 1 = Echo Saturation Error
7.	rx_band_attenuated	Rx Band Attenuation	0 = not applied 1 = applied
8.	cycle_report_error	Cycle Report General Error	0 = Cycle Report is 0 1 = Cycle Report is not 0

3.5.6 L1B flag_mcd_20_ku flag meaning:

ID	Flag Name	Definition	Setting
1.	block_degraded	Block Degraded	0 = OK 1 = Degraded (set if the block should not be processed – indicated by **bold** typeface)
2.	blank_block	Blank Block	0 = OK 1 = Blank Block inserted for record padding
3.	datation_degraded	Datation Degraded	0 = OK 1 = Datation is bad or not set
4.	orbit_prop_error	Orbit Propagation Error	0 = OK 1 = Error (returned by CFI or independent check)
5.	orbit_file_change	Orbit File Change	0 = OK 1 = Orbit file has changed wrt previous record
6.	orbit_gap	Orbit Discontinuity	0 = OK 1 = discontinuity (e.g. gap)
7.	echo_saturated	Echo Saturation (from Cycle Report)	0 = OK 1 = Saturated
8.	other_echo_error	Other Echo Error	0 = OK 1 = Echo Error (bit fields Tracking Echo Error or Echo Rx1 Error or Echo Rx2 Error set to 1)
9.	sarin_rx1_error	Rx 1 Channel Error for SARIN	0 = OK 1 = degraded or missing
10.	sarin_rx2_error	Rx 2 Channel error for SARIN	0 = OK 1 = degraded or missing
11.	window_delay_error	Window Delay Inconsistency	0 = OK (value is in range) 1 = value out of range or computation error
12.	agc_error	AGC Inconsistency	0 = OK (value is in range) 1 = value out of range or computation error
13.	cal1_missing	CAL1 Correction Missing	0 = correction applied 1 = correction not applied
14.	cal1_default	CAL1 Correction from IPF DB	0 = correction from CAL1 product used 1 = correction from IPF DB used
15.	doris_uso_missing	DORIS USO Correction	0 = USO Correction Factor is available

ID	Flag Name	Definition	Setting
			1 = USO Correction Factor is not available
16.	ccal1_default	complex CAL1 Correction from IPF DB	0 = correction from Complex CAL1 Product used 1 = correction from IPF DB used
17.	trk_echo_error	TRK Echo Error	0 = OK 1 = empty (or null) tracking echo
18.	echo_rx1_error	Echo Rx 1 Error	0 = OK 1 = empty (or null) raw echo
19.	echo_rx2_error	Echo Rx2 Error	0 = OK 1 = empty (or null) raw echo
20.	npm_error	NPM Inconsistency	0 = OK 1 = value out of range or computation error
21	cal1_pwr_corr_type	CAL 1 Correction Type	0 = Peak Power used for CAL 1 correction 1= Integrated Power used for CAL1 correction
23.	phase_pert_cor_missing	Phase Perturbation Correction application	0 = applied 1 = not applied
24.	cal2_missing	CAL2 Correction Missing	0 = correction applied 1 = correction not applied
25.	cal2_default	CAL2 Correction from IPF DB	0 = correction from CAL2 product used 1 = correction from IPF DB used
26.	power_scale_error	Power Scaling Error (for LRM/FDM only)	0 = OK (echo has been power scaled) 1 = Error in scaling (L1B waveform is null) Used only for LRM L1B and FDM L1B
27.	attitude_cor_missing	Attitude Correction Missing	0 = OK, Correction Applied 1 = Not Corrected
28.	phase_pert_cor_default	Phase Perturbation Correction mode	0 = computed by CCAL1 1 = default from IPF DB used (applicable only to SARin data)

3.5.7 FBR flag_mcd_xx_ku flag meaning:

ID	Flag Name	Definition	Setting
1.	block_degraded	Block Degraded	0 = OK 1 = Degraded

ID	Flag Name	Definition	Setting
			(set if the block should not be processed – indicated by **bold** typeface)
2.	blank_block	Blank Block	0 = OK 1 = Blank Block inserted for record padding
3.	datation_degraded	Datation Degraded	0 = OK 1 = Datation is bad or not set
4.	orbit_prop_error	Orbit Propagation Error	0 = OK 1 = Error (returned by CFI or independent check)
5.	orbit_file_change	Orbit File Change	0 = OK 1 = Orbit file has changed wrt previous record
6.	orbit_gap	Orbit Discontinuity	0 = OK 1 = discontinuity (e.g. gap)
7.	echo_saturated	Echo Saturation (from Cycle Report)	0 = OK 1 = Saturated
8.	other_echo_error	Other Echo Error	0 = OK 1 = Echo Error (bit fields Tracking Echo Error or Echo Rx1 Error or Echo Rx2 Error set to 1)
9.	sarin_rx1_error	Rx 1 Channel Error for SARIN	0 = OK 1 = degraded or missing
10.	sarin_rx2_error	Rx 2 Channel error for SARIN	0 = OK 1 = degraded or missing
11.	window_delay_error	Window Delay Inconsistency	0 = OK (value is in range) 1 = value out of range or computation error
12.	agc_error	AGC Inconsistency	0 = OK (value is in range) 1 = value out of range or computation error
13.	cal1_missing	CAL1 Correction Missing	0 = correction applied 1 = correction not applied
14.	cal1_default	CAL1 Correction from IPF DB	0 = correction from CAL1 Product used 1 = correction from IPF DB used
15.	doris_uso_missing	DORIS USO Correction	0 = USO Correction Factor is available 1 = USO Correction Factor is not available
16.	ccal1_default	Complex CAL1 Correction from IPF DB	0 = correction from Complex CAL1 Product used 1 = correction from IPF DB used

ID	Flag Name	Definition	Setting
17.	trk_echo_error	TRK Echo Error	0 = OK 1 = empty (or null) tracking echo
18.	echo_rx1_error	Echo Rx 1 Error	0 = OK 1 = empty (or null) raw echo
19.	echo_rx2_error	Echo Rx2 Error	0 = OK 1 = empty (or null) raw echo
20.	npm_error	NPM Inconsistency	0 = OK 1 = value out of range or computation error
22.	attitude_cor_missing	Attitude Correction Missing	0 = OK, attitude correction applied 1 = missing, correction not applied.
23.	cal1_pwr_corr_type	CAL 1 Correction Type	0 = Peak Power used for CAL 1 correction 1= Integrated Power used for CAL1 correction

3.6 GLOBAL ATTRIBUTES

The global attributes contain general information about the product and are listed in this section.

Each attribute is described here for the sake of clarity and to provide traceability back to the corresponding EE Header field where the attributecomes from.

In reality the attributes are not grouped but simply listed inside the CONFORM product.

Product Identification Information		
Attribute Name	**Description**	**Values**
product_name	Product File Name	any string
processing_stage	Processing stage code identifier.	RPRO = Reprocessing OFFL = Routine Operation NRT_ = Near Real Time TEST = Test LTA_ = Long Term

Product Identification Information		
Attribute Name	**Description**	**Values**
		Archive
reference_document	Reference DFCB Document describing the product	any string
doi	Digital Object Identifier	any string
acquisition_station	Acquisition Station	any string
mission	Mission Name	Cryosat
processing_centre	Processing Facility	PDS

Data Processing Information	
Attribute Name	**Description**
creation_time	Processing Time (Product Generation Time)
sensing_start	Sensing start time
sensing_stop	Sensing stop time
software_version	Processor Name and software version number

Orbit Information	
Attribute Name	**Description**
phase	Phase Code (set to X if not used)
cycle_number	Cycle Number (set to +000 if not used)
rel_orbit_number	Relative Orbit Number at sensing start time (set to +00000 if not used)
abs_orbit_number	Absolute Orbit Number at sensing start time (set to +00000 if not used)
state_vector_time	UTC state vector time
delta_ut1	Universal Time Correction: DUT1 = UT1 – UTC
x_position	X position in Earth Fixed Reference If not used set to +0000000.000
y_position	Y position in Earth Fixed Reference If not used set to +0000000.000
z_position	Z position in Earth Fixed Reference If not used set to +0000000.000
x_velocity	X velocity in Earth Fixed Reference If not used set to +0000.000000
y_velocity	Y velocity in Earth Fixed Reference If not used set to +0000.000000
z_velocity	Z velocity in Earth Fixed Reference If not used set to +0000.000000
vector_source	Source of Orbit State Vector Record: fos predicted doris_navigator doris_precise fos_restituted

Orbit Information	
Attribute Name	**Description**
	doris_preliminary

Leap Second Information	
Attribute Name	**Description**
leap_utc	UTC Time of the occurrence of the leap second. If a leap second occurred in the product window the field is set by a devoted function in the CFI EXPLORER_ORBIT library (see [EXPL_ORB-SUM] for details), otherwise it is not set. It corresponds to the time after the Leap Second occurrence (i.e. midnight of the day after the leap second)
leap_sign	If a leap second occurred in the product window the field is set to the expected value by a devoted function in the CFI EXPLORER_ORBIT library (see [EXPL_ORB-SUM] for details), otherwise it is not set
leap_err	This field is always not set considering that CRYOSAT products have true UTC times

Product Confidence Data Information	
Attribute Name	**Description**
product_err	Product Error Flag: 0 errors have been reported in the Product 0 no errors

Product Time Information	
Attribute Name	**Description**
first_record_time	TAI of the first record in the Main MDS of this product
last_record_time	TAI of the last record in the Main MDS of this product

Product Orbit Information	
Attribute Name	**Description**
abs_orbit_start	Absolute Orbit Number at sensing start time.
Rel_time_asc_node_start	Relative time since crossing ascending node time relative to start time of data sensing.
Abs_orbit_stop	Absolute Orbit Number at sensing stop time.
Rel_time_asc_node_stop	Relative time since crossing ascending node time relative to stop time of data sensing.
Equator_cross_time	Time of equator crossing at the ascending node relative to the sensing start time.
Equator_cross_long	Longitude of equator crossing at the ascending node relative to the sensing start time (positive East, 0 = Greenwich) referred to WGS84.
Ascending_flag	Orbit Orientation at the sensing start time: A=Ascending D=Descending

Product Location Information	
Attribute Name	**Description**
first_record_lat	WGS84 latitude of the first record in the Main MDS (positive north)
first_record_lon	WGS84 longitude of the first record in the Main MDS (positive East, 0 = Greenwich)
last_record_lat	WGS84 latitude of the last record in the Main MDS (positive north
last_record_lon	WGS84 longitude of the last record in the Main MDS (positive East, 0 = Greenwich)

SIRAL Level 0 Quality information	
Attribute Name	**Description**
l0_proc_flag	Processing errors significance flag : 1 errors (percentage of errors greater than threshold) 0 no errors
l0_processing_quality	Percentage of quality checks successfully passed during ISP processing : max allowed +10000
l0_proc_thresh	Minimum acceptable percentage of quality threshold that must be passed during ISP processing: max allowed +10000
l0_gaps_flag	Flag to indicate gaps in input data: 1 gaps0 no gaps
l0_gaps_num	Number of gaps detected during ISP processing

SIRAL Instrument Configuration	
Attribute Name	**Description**
instr_id	Instrument_Identifier : A = SIRAL Nominal B = SIRAL Redundant
sir_op_mode	SIRAL Operative Mode: LRM SAR SARIN
sir_configuration	SIRAL Rx Configuration : RX_1 RX_2 BOTH UNKNOWN

Level 1 Surface Statistics	
Attribute Name	**Description**
open_ocean_percent	Percentage of output L1B records detected on open ocean or semi-enclosed seas
close_sea_percent	Percentage of output L1B records detected on close seas or lakes
continent_ice_percent	Percentage of output L1B records detected on continental ice
land_percent	Percentage of output L1B records detected on land

SIRAL Level 1 Processing information	
Attribute Name	**Description**
l1b_prod_status	Complete/Incomplete Product Completion Flag (0 or 1). 1 if the product has a duration shorter than the input Level 0
l1b_proc_flag	Processing errors significance flag 1 errors (percentage of errors greater than threshold) 0 no errors
l1b_processing_quality	Percentage of quality checks successfully passed during Level 1B processing (max allowed +10000)
l1b_proc_thresh	Minimum acceptable percentage of quality threshold that must be passed during Level 1B processing (max allowed +10000)

Reference DSD	
Attribute Name	**Description**
xref_cal1	L1B CAL1 file
xref_cal1_sarin	L1B Complex CAL1 SARIn file
xref_cal2	L1B CAL2 file
xref_constants	Geophysical Constants File
xref_dip_map	Bent Modified Dip Map File used for Bent Model Ionospheric Correction
xref_earth_tide	Earth Tide File (Cartwright & Edden 1973)
xref_gim	Global Ionospheric Map generated by using either analysis or forecast data
xref_iono_cor	Ionospheric Coefficients file used for Bent Model Ionospheric Correction

Reference DSD	
Attribute Name	**Description**
xref_mean_pressure	Mean Pressure File for Meteo Correction generated by using either analysis or forecast data
xref_meteo	Meteo Grid Definition File
xref_mog2d	2D Gravity Wave model for Dynamic Atmospheric Correction (DAC) generated by using either analysis or forecast data
xref_ocean_tide	Ocean Tide File
xref_orbit	Orbit File
xref_orbit_scenario	Orbit Scenario File
xref_pconf	Processor Configuration Parameters File
xref_pole_location	Pole Tide File
xref_s1_tide_amplitude	S1 tide grid of monthly mean of global amplitude
xref_s1_tide_phase	S1 tide grid of monthly mean of global phase
xref_s1s2_pressure_00h	Climatology Pressure Grids for each month at 00 h.
xref_s1s2_pressure_06h	Climatology Pressure Grids for each month at 06 h.
xref_s1s2_pressure_12h	Climatology Pressure Grids for each month at 12 h.
xref_s1s2_pressure_18h	Climatology Pressure Grids for each month at 18 h.
xref_s2_tide_amplitude	S2 tide grid of monthly mean of global amplitude
xref_s2_tide_phase	S2 tide grid of monthly mean of global phase
xref_sai	Solar Activity Index File used for Bent Model Ionospheric Correction
xref_siral_characterisation	SIRAL IPFDB File
xref_siral_l0	SIRAL L0 File
xref_star_tracker_attref	Star Tracker Level 1B File
xref_surf_pressure	Surface Pressure File for Meteo Correction generated by using either analysis or forecast data

Reference DSD	
Attribute Name	**Description**
xref_surf_type	Surface Type Map File
xref_tidal_load	Tidal Loading File
xref_u_wind	U Wind component File for Meteo Correction generated by using either analysis or forecast data
xref_uso	DORIS USO File
xref_v_wind	V Wind component File for Meteo Correction generated by using either analysis or forecast data
xref_wet_trop	Wet Troposphere File for Meteo Correction generated by using either analysis or forecast data

3.7 TABLE OF REFERENCE DSD VS L1B/FBR PROCESSORS

			Processors		
			LRM	SAR	SRN
Reference DSD HDR	**Reference Attribute Netcdf**	**File Type**			
PROC_CONFIG_PARAMS_FILE	xref_pconf	-	M	M	M
CALIBRATION_TYPE_1_FILE	xref_cal1	SIR1LRC11B SIR2LRC11B	M		
		SIR1SAC11B SIR2SAC11B		M	
		SIR_SIC11B			M
SIR_COMPLEX_CAL1_SARIN	xref_cal1_sarin	SIR_SICC1B			M
CALIBRATION_TYPE_2_FILE	xref_cal2	SIR1SAC21B SIR2SAC21B	M	M	
		SIR1SIC21B SIR2SIC21B			M

			Processors		
			LRM	SAR	SRN
CONSTANTS_FILE	xref_constants	.	M	M	M
MODIFIED_DIP_MAP_FILE	xref_dip_map	AUX_DIPMAP	M	M	M
EARTH_TIDE_FILE	xref_earth_tide	AUX_CARTWR	M	M	M
GPS_IONO_MAP	xref_gim	AUX_IONGIM	M	M	M
IONO_COEFFICENTS_FILE	xref_iono_cor	AUX_MICOEF	M	M	M
MEAN_PRESSURE_FILE	xref_mean_pressure	AUX_SEAMPS	M	M	M
METEO_GRID_DEF_FILE	xref_meteo	AUX_ALTGRD	M	M	M
AUX_MOG2D	xref_mog2d	AUX_MOG_2D	M	M	M
OCEAN_TIDE_FILE	xref_ocean_tide	AUX_OCTIDE	M	M	M
ORBIT_FILE	xref_orbit	MPL_ORBPRE AUX_ORBDOR AUX_ORBDOP	M	M	M
SCENARIO_FILE	xref_orbit_scenario	MPL_ORBREF	M	M	M
POLE_TIDE_FILE	xref_pole_location	AUX_POLLOC	M	M	M
S1_TIDE_AMPLITUDE_MAP	xref_s1_tide_amplitude	AUX_S1AMPL	M	M	M
S1_TIDE_PHASE_MAP	xref_s1_tide_phase	AUX_S1PHAS	M	M	M
S1S2_PRESSURE_00H_MAP	xref_s1s2_pressure_00h	AUX_PRSS00	M	M	M
S1S2_PRESSURE_06H_MAP	xref_s1s2_pressure_06h	AUX_PRSS06	M	M	M
S1S2_PRESSURE_12H_MAP	xref_s1s2_pressure_12h	AUX_PRSS12	M	M	M
S1S2_PRESSURE_18H_MAP	xref_s1s2_pressure_18h	AUX_PRSS18	M	M	M
S2_TIDE_AMPLITUDE_MAP	xref_s2_tide_amplitude	AUX_S1AMPL	M	M	M

			Processors		
			LRM	SAR	SRN
S2_TIDE_PHASE_MAP	xref_s2_tide_phase	AUX_S2PHAS	M	M	M
SAI_FILE	xref_sai	AUX_SUNACT	M	M	M
IPF_RA_DATABASE_FILE	xref_siral_characterisation	AUX_IPFDBA AUX_IPFDBB	M	M	M
SIRAL_LEVEL_0_FILE	xref_siral_l0	SIR1SIN_0_ SIR2SIN_0_ SIR1TKSI0_ SIR2TKSI0_			M
		SIR1LRM_0_ SIR2LRM_0_	M		
		SIR1SAR_0_ SIR2SAR_0_		M	
STAR_TRACKER_ATTREF_FILE	xref_star_tracker_attref	STR_ATTREF	M	M	M
SURFACE_PRESSURE_FILE	xref_surf_pressure	AUX_SURFPS	M	M	M
SURFACE_TYPE_FILE	xref_surf_type	AUX_LS_MAP	M	M	M
TIDAL_LOADING_FILE	xref_tidal_load	AUX_TDLOAD	M	M	M
U_WIND_FILE	xref_u_wind	AUX_U_WIND	M	M	M
DORIS_USO_DRIFT_FILE	xref_uso	AUX_DORUSO	M	M	M
V_WIND_FILE	xref_v_wind	AUX_V_WIND	M	M	M
WET_TROPOSPHERE_FILE	xref_wet_trop	AUX_WETTRP	M	M	M

4 CRYOSAT LEVEL-1B CONFORM PRODUCTS

The following table provides the Product Identification for each CONFORM product generated by the IPF1.

CONFORM Products	
Product Identification	**Description**
SIR1SAR_FR	Level 1 FBR SAR Mode (Rx1 Channel)
SIR2SAR_FR	Level 1 FBR SAR Mode (Rx2 Channel)
SIR_SIN_FR	Level 1 FBR SARIn Mode
SIR_LRM_1B	Level 1 Product Low Rate Mode
SIR_SAR_1B	Level 1 SAR Mode
SIR_SIN_1B	Level 1 SARIn Mode
SIR_SAR1BS	Level 1 SAR Stack Mode
SIR_SIN1BS	Level 1 SARIn Stack Mode

Table 3-1: Level 1B CONFORM products list

4.1 CONFORM PRODUCT FILE NAMES

The file name of each Level-1B product abides to the following conventions (the variable parts are in italics):

***MM_CCCC_TTTTTTTTTT_yyyymmddThhmmss_YYYYMMDDTHHMMSS_bvvv*.nc**

where

MM is the mission identifier **CS** for CryoSat

CCCC is the file class (i.e.: OFFL for routine operation, NRT_ for Near Real Time, RPRO for Reprocessing, TEST for Testing or TIxx for stand alone IPF1 testing associated to Test Data Sets tagged as Tixx, LTA_ for products generated in the Long Term Archive).

TTTTTTTTTT is the file type and corresponds to the Product ID of the Table 3-1.

yyyymmddThhmmss is the validity start time and correspond to the time of the first valid record stored in the Interim FBR.

YYYYMMDDTHHMMSS is the validity stop time and correspond to time of the last valid record stored in the Interim FBR.

b is the baseline identifier as read-in from the PCONF.

vvv is the product version number.

For example in the case of an operational Level-1B product of the SIRAL instrument in Low Rate Mode (LRM) in baseline A and product version 1 the name would be:

CS_OFFL_SIR_LRM1B_20030624T075728_20030624T080231_C001.nc

Appendix A: Variables to Products

	FBR		L1B			L1Bs	
	SAR	SARIn	LRM	SAR	SARIn	SAR	SAR
agc_ch1_20_ku(time_20_ku)			x	x	x	x	x
agc_1_21_ku(time_21_ku)		x					
agc_1_85_ku(time_85_ku)	x						
agc_ch2_20_ku(time_20_ku)			x	x	x	x	x
agc_2_21_ku(time_21_ku)		x					
agc_2_85_ku(time_85_ku)	x						
alt_avg_01_ku(time_avg_01_ku)			x				
alt_plrm_01_ku(time_plrm_01_ku)				x	x		
alt_plrm_20_ku(time_plrm_20_ku)				x	x		
alt_20_ku(time_20_ku)			x	x	x	x	x
alt_21_ku(time_21_ku)		x					
alt_85_ku(time_x85ku)	x						
off_nadir_pitch_angle_str_20_ku(time_20_ku)			x	x	x	x	x
off_nadir_roll_angle_str_20_ku(time_20_ku)			x	x	x	x	x
off_nadir_yaw_angle_str_20_ku(time_20_ku)			x	x	x	x	x
beam_dir_vec_20_ku(time_20_ku,space_3d)			x	x	x	x	x
beam_dir_vec_21_ku(time_21_ku,space_3d)		x					
beam_dir_vec_85_ku(time_95_ku,space_3d)	x						
coherence_waveform_20_ku(time_20_ku, ns_20_ku)					x		
cor2_applied_20_ku(time_20_ku)			x	x	x	x	x
cor2_applied_21_ku(time_21_ku)		x					
cor2_applied_85_ku(time_85_ku)	x						
cplx_waveform_ch1_i_21_ku(time_21_ku,np_ku)		x					
cplx_waveform_ch1_i_85_ku(time_85_ku,np_ku)	x						
cplx_waveform_ch1_q_21_ku(time_21_ku,np_ku)		x					
cplx_waveform_ch1_q_85_ku(time_85_ku,np_ku)	x						
cplx_waveform_ch2_i_21_ku(time_21_ku,np_ku)		x					
cplx_waveform_ch2_q_21_ku(time_21_ku,np_ku)		x					
dop_angle_start _20_ku(time_20_ku)				x	x		
dop_angle_stop _20_ku(time_20_ku)				x	x		
dop_cor_20_ku(time_20_ku)			x	x	x	x	x
dop_cor_21_ku(time_21_ku)		x					
dop_cor_85_ku(time_85_ku)	x						
echo_numval_avg_01_ku(time_avg_01_ku)			x				
echo_numval_plrm_01_ku(time_plrm_01_ku)				x	x		

	FBR		L1B			L1Bs	
	SAR	SARIn	LRM	SAR	SARIn	SAR	SAR
echo_numval_plrm_20_ku(time_plrm_20_ku)				x	x		
echo_numval_20_ku(time_20_ku)			x	x	x		
echo_numval_21_ku(time_21_ku)		x					
echo_numval_85_ku(time_85_ku)	x						
echo_scale_factor_avg_01_ku(time_avg_01_ku)			x				
echo_scale_factor_plrm_01_ku(time_plrm_01_ku)				x	X		
echo_scale_factor_plrm_20_ku(time_plrm_20_ku)				x	x		
echo_scale_factor_20_ku(time_20_ku)			x	x	x		
echo_scale_pwr_20_ku(time_20_ku)			x	x	x		
echo_scale_pwr_avg_01_ku(time_avg_01_ku)			x				
echo_scale_pwr_plrm_01_ku(time_plrm_01_ku)				x	x		
echo_scale_pwr_plrm_20_ku(time_plrm_20_ku)				x	x		
flag_cor_err_01(time_01_ku)		x	x	x	x		
flag_cor_status_01(time_01_ku)		x	x	x	x		
flag_echo_20_ku(time_20_ku)			x	x	x		
flag_echo_21_ku(time_21_ku)		x					
flag_echo_85_ku(time_85_ku)	x						
flag_echo_avg_01_ku(time_avg_01_ku)			x				
flag_echo_plrm_01_ku(time_plrm_01_ku)				x	x		
flag_echo_plrm_20_ku(time_plrm_20_ku)				x	x		
flag_instr_conf_rx_bwdt_20_ku(time_20_ku)			x	x	x	x	x
flag_instr_conf_rx_bwdt_21_ku(time_21_ku)		x					
flag_instr_conf_rx_bwdt_85_ku(time_85_ku)	x						
flag_instr_conf_rx_flags_20_ku(time_20_ku)			x	x	x	x	x
flag_instr_conf_rx_flags_21_ku(time_21_ku)		x					
flag_instr_conf_rx_flags_85_ku(time_85_ku)	x						
flag_instr_conf_rx_in_use_20_ku(time_20_ku)			x	x	x	x	x
flag_instr_conf_rx_in_use_21_ku(time_21_ku)		x					
flag_instr_conf_rx_in_use_85_ku(time_85_ku)	x						
flag_instr_conf_rx_str_in_use_20_ku(time_20_ku)			x	x	x	x	x
flag_instr_conf_rx_str_in_use_21_ku(time_21_ku)		x					
flag_instr_conf_rx_str_in_use_85_ku(time_85_ku)	x						
flag_instr_conf_rx_trk_mode_20_ku(time_20_ku)			x	x	x	x	x
flag_instr_conf_rx_trk_mode_21_ku(time_21_ku)		x					
flag_instr_conf_rx_trk_mode_85_ku(time_85_ku)	x						
flag_instr_mode_att_ctrl_20_ku(time_20_ku)			x	x	x	x	x
flag_instr_mode_att_ctrl_21_ku(time_21_ku)		x					
flag_instr_mode_att_ctrl_85_ku(time_85_ku)	x						

	FBR		L1B			L1Bs	
	SAR	SARIn	LRM	SAR	SARIn	SAR	SAR
flag_instr_mode_flags_20_ku(time_20_ku)			x	x	x	x	x
flag_instr_mode_flags_21_ku(time_21_ku)		x					
flag_instr_mode_flags_85_ku(time_85_ku)	x						
flag_instr_mode_op_20_ku(time_20_ku)			x	x	x	x	x
flag_instr_mode_op_21_ku(time_21_ku)		x					
flag_instr_mode_op_85_ku(time_85_ku)	x						
flag_mcd_20_ku(time_20_ku)			x	x	x	x	x
flag_mcd_21_ku(time_21_ku)		x					
flag_mcd_85_ku(time_85_ku)	x						
surf_type_01(time_cor_01)	x	x	x	x	x		
flag_trk_cycle_20_ku(time_20_ku)			x				
h0_applied_20_ku(time_20_ku)			x	x	x	x	x
h0_applied_21_ku(time_21_ku)		x					
h0_applied_85_ku(time_85_ku)	x						
h0_fai_word_20_ku(time_20_ku)			x	x	x	x	x
h0_fai_word_21_ku(time_21_ku)		x					
h0_fai_word_85_ku(time_85_ku)	x						
h0_lai_word_20_ku(time_20_ku)			x	x	x	x	x
h0_lai_word_21_ku(time_21_ku)		x					
h0_lai_word_85_ku(time_85_ku)	x						
hf_fluct_total_cor_01(time_cor_01)	x	x	x	x	x		
ind_first_meas_20hz_01(time_cor_01)			x	x	x		
ind_meas_1hz_20_ku(time_20_ku)			x	x	x		
instr_cor_gain_rx_20_ku(time_20_ku)			x	x	x	x	x
instr_cor_gain_rx_21_ku(time_21_ku)		x					
instr_cor_gain_rx_85_ku(time_85_ku)	x						
instr_cor_gain_tx_rx_20_ku(time_20_ku)			x	x	x	x	x
instr_cor_gain_tx_rx_21_ku(time_21_ku)		x					
instr_cor_gain_tx_rx_85_ku(time_85_ku)	x						
instr_cor_range_rx_20_ku(time_20_ku)			x	x	x	x	x
instr_cor_range_rx_21_ku(time_21_ku)		x					
instr_cor_range_rx_85_ku(time_85_ku)	x						
instr_cor_range_tx_rx_20_ku(time_20_ku)			x	x	x	x	x
instr_cor_range_tx_rx_21_ku(time_21_ku)		x					
instr_cor_range_tx_rx_85_ku(time_85_ku)	x						
instr_ext_ph_cor_20_ku(time_20_ku)					x		x
instr_ext_ph_cor_21_ku(time_21_ku)		x					
instr_int_ph_cor_20_ku(time_20_ku)					x		x

	FBR		L1B			L1Bs	
	SAR	SARIn	LRM	SAR	SARIn	SAR	SAR…
instr_int_ph_cor_21_ku(time_21_ku)		x					
seq_count_20_ku(time_20_ku)	x	x	x	x	x	x	x
seq_count_21_ku(time_21_ku)		x					
seq_count_85_ku(time_85_ku)	x						
inter_base_vec_20_ku(time_20_ku,space_3d)			x	x	x	x	x
inter_base_vec_21_ku(time_21_ku,space_3d)		x					
inter_base_vec_85_ku(time_85_ku,space_3d)	x						
inv_bar_cor_01(time_cor_01)	x	x	x	x	x		
iono_cor_01(time_cor_01)	x	x	x	x	x		
iono_cor_gim_01(time_cor_01)	x	x	x	x	x		
lat_20_ku(time_20_ku)			x	x	x	x	x
lat_21_ku(time_21_ku)		x					
lat_85_ku(time_85_ku)	x						
lat_cor_01_ku(time_cor_01_ku)			x	x	x		
lat_avg_01_ku(time_avg_01_ku)			x				
lat_plrm_01_ku(time_plrm_01_ku)				x	x		
lat_plrm_20_ku(time_plrm_20_ku)				x	X		
load_tide_01(time_cor_01)	x	x	x	x	X		
lon_20_ku(time_20_ku)			x	x	X	x	x
lon_21_ku(time_21_ku)		x					
lon_85_ku(time_85_ku)	x						
lon_cor_01_ku(time_cor_01_ku)			x	x	X		
lon_avg_01_ku(time_avg_01_ku)			x				
lon_plrm_01_ku(time_plrm_01_ku)				x	X		
lon_plrm_20_ku(time_plrm_20_ku)				x	x		
look_angle_start_20_ku(time_20_ku)				x	X		
look_angle_stop_20_ku(time_20_ku)				x	x		
noise_power_20_ku(time_20_ku)			x	x	x	x	x
noise_power_21_ku(time_21_ku)		x					
noise_power_85_ku(time_85_ku)	x						
mod_dry_tropo_cor_01(time_cor_01)	x	x	x	x	x		
mod_wet_tropo_cor_01(time_cor_01)	x	x	x	x	x		
ocean_tide_01(time_cor_01)	x	x	x	x	x		
ocean_tide_eq_01(time_cor_01)	x	x	x	x	x		
orb_alt_rate_20_ku(time_20_ku)			x	x	x	x	x
orb_alt_rate_21_ku(time_21_ku)		x					
orb_alt_rate_85_ku(time_85_ku)	x						
ph_slope_cor_20_ku(time_20_ku)					x		x

	FBR		L1B			L1Bs	
	SAR	SARIn	LRM	SAR	SARIn	SAR	SAR
ph_slope_cor_21_ku(time_21_ku)		x					
ph_diff_waveform_20_ku(time_20_ku, ns_20_ku)					x		
pole_tide_01(time_cor_01)	x	x	x	x	x		
pwr_waveform_20_ku(time_20_ku, ns_20_ku)			x	x	x		
pwr_waveform_avg_01_ku(time_avg_01_ku, ns_avg_01_ku)			x				
pwr_waveform_plrm_01_ku(time_plrm_01_ku, ns_plrm_01_ku)				x	x		
pwr_waveform_plrm_20_ku(time_plrm_20_ku,ns_plrm_20_ku)				x	x		
rec_count_20_ku(time_20_ku)			x	x	x	x	x
rec_count_21_ku(time_21_ku)		x					
rec_count_85_ku(time_85_ku)	x						
sat_vel_vec_20_ku(time_20_ku,space_3d)			x	x	x	x	x
sat_vel_vec_21_ku(time_21_ku,space_3d)		x					
sat_vel_vec_85_ku(time_85_ku,space_3d)	x						
solid_earth_tide_01(time_cor_01)	x	x	x	x	x		
stack_centre_20_ku(time_20_ku)				x	x		
stack_centre_angle_20_ku(time_20_ku)				x	x		
stack_centre_look_angle_20_ku(time_20_ku_				x	x		
stack_gaussian_fitting_residuals_20_ku(time_20_ku)				x	x		
stack_kurtosis_20_ku(time_20_ku)				x	x		
stack_number_after_weighting_20_ku(time_20_ku)				x	x		
stack_number_before_weighting_20_ku(time_20_ku)				x	x		
stack_peakiness_20_ku(time_20_ku)				x	x		
stack_mask_start_stop_20_ku(time_20_ku)				x	x		
stack_scaled_amplitude_20_ku(time_20_ku)				x	x		
stack_skewness_20_ku(time_20_ku)				x	x		
stack_std_20_ku(time_20_ku)				x	x		
stack_std_angle_20_ku(time_20_ku)				x	x		
time_20_ku(time_20_ku)			x	x	x	x	x
time_21_ku(time_21_ku)		x					
time_85_ku(time_85_ku)	x						
time_avg_01_ku(time_avg_01_ku)			x				
time_plrm_01_ku(time_plrm_01_ku)				x	x		
time_cor_01(time_cor_01)	x	x	x	x	x		
time_plrm_20_ku(time_plrm_20_ku)				x	x		
tot_gain_ch1_20_ku(time_20_ku)			x	x	x	x	x
tot_gain_ch1_21_ku(time_21_ku)		x					
tot_gain_ch1_85_ku(time_85_ku)	x						

	FBR		L1B			L1Bs	
	SAR	SARIn	LRM	SAR	SARIn	SAR	SAR
tot_gain_ch2_20_ku(time_20_ku)			x	x	x	x	x
tot_gain_ch2_21_ku(time_21_ku)		x					
tot_gain_ch2_85_ku(time_85_ku)	x						
transmit_pwr_20_ku(time_20_ku)			x	x	x	x	x
transmit_pwr_21_ku(time_21_ku)		x					
transmit_pwr_85_ku(time_85_ku)	x						
uso_cor_20_ku(time_20_ku)			x	x	x	x	x
uso_cor_avg_01_ku(time_avg_01_ku)			x				
uso_cor_plrm_01_ku(time_plrm_01_ku)				x	x		
uso_cor_21_ku(time_21_ku)		x					
uso_cor_85_ku(time_85_ku)	x						
uso_cor_plrm_20_ku(time_plrm_20_ku)				x	x		
window_del_20_ku(time_20_ku)			x	x	x	x	x
window_del_21_ku(time_21_ku)		x					
window_del_85_ku(time_85_ku)	x						
window_del_avg_01_ku(time_avg_01_ku)			x	x	x		
window_del_plrm_01_ku(time_plrm_01_ku)				x	x		
window_del_plrm_20_ku(time_plrm_20_ku)				x	x		
sl_time_ku(time_20_ku, nlooks_ku)						x	x
doppler_angle_ku(time_20_ku, nlooks_ku)						x	x
doppler_range_correction_ku(time_20_ku, nlooks_ku)						x	x
look_angle_ku(time_20_ku, nlooks_ku)						x	x
pointing_angle_ku(time_20_ku, nlooks_ku)						x	x
slant_range_correction_ku(time_20_ku, nlooks_ku)						x	x
sl_counter_ku(time_20_ku, nlooks_ku)						x	x
sl_waveform_ch1_i_ku(time_20_ku, nlooks_ku, ns_20_ku)						x	x
sl_waveform_ch1_q_ku(time_20_ku, nlooks_ku, ns_20_ku)						x	x
sl_waveform_ch2_i_ku(time_20_ku, nlooks_ku, ns_20_ku)						x	x
sl_waveform_ch2_q_ku(time_20_ku, nlooks_ku, ns_20_ku)						x	x
iq_scale_factor_ch1_ku(time_20_ku, nlooks_ku)						x	x
iq_scale_factor_ch2_ku(time_20_ku, nlooks_ku)						x	x

Appendix B: Default Setting of the Attribute: _FillValue

By design, each variable of the CONFORM products has a _FillValue attribute, which contains the default value of that variable, i.e. the value the variable holds when its content hasn't been changed by the CryoSat processor.

The only exceptions to this rule are the variables that use the whole validity range of their types and these are:

Variables with no _FillValue			
name	**type**	**units**	**comment**
cplx_waveform_ch1_i_x_ku(time_x_ku,np_ku)	byte	count	power waveforms i samples (ch1)
cplx_waveform_ch1_q_x_ku(time_x_ku,np_ku)	byte	count	power waveforms q samples (ch1)
cplx_waveform_ch2_i_x_ku(time_x_ku,np_ku)	byte	count	power waveforms i samples (ch2)
cplx_waveform_ch2_q_x_ku(time_x_ku,np_ku)	byte	count	power waveforms q samples (ch2)
seq_count_20_ku(time_20_ku)	short	count	Source Sequence Counter read from the L0 echo telemetry packet
pwr_waveform_avg_01_ku(time_avg_01_ku, ns_avg_01_ku)	ushort	count	1Hz averaged fully-calibrated power waveform. Obtained by averaging all individual L0 echoes covering approx 1 second after range compressopon. Units are counts scaled to fit in the range 0-65535.
pwr_waveform_plrm_01_ku(time_plrm_01_ku, ns_plrm_01_ku)	ushort	count	1Hz averaged fully-calibrated power waveform. Obtained by averaging all individual L0 echoes covering approx 1 second after range compressopon. Units are counts scaled to fit in the range 0-65535.

pwr_waveform_20_ku(time_20_ku, ns_20_ku)	ushort	count	The L1b 20Hz power waveform is a fully-calibrated, high resolution multilooked waveform. Units are counts scaled to fit in the range 0-65535.
rec_count_20_ku(time_20_ku)	int	count	Record counter - progressive counter incremented by 1 for each data block.

For the above variables, the _FillValue is missing but it is possible to figure out whether the variables are meaningful or not by checking the status of some flags.

In particular, as to the counters (i.e. rec_count_20_ku and seq_count_20_ku) there is no way to know whether they are meaningful so the only case when their contents shouldn't be used (as any other variables) is when the whole block containing the counters are flagged as invalid (i.e. the following bitfields are set in flag_mcd_20_ku: `block_degraded blank_block datation_degraded`)

Likewise specific bitfields in the same flag are devoted to flag the validity or the errors in the waveforms.

For all the remaining variables (with a few exceptions, see later) the default _FillValue for each type is as follows:

_FillValue Specific Settings	
variable type	**_FillValue**
byte	-128b
double	NaN
int	-2147483648
int64	–9223372036854775808LL
short	-32768
ushort	32767US

The above convention is not used in the following cases:

_FillValue Default Settings			
Variable Name	**Variable Type**	**_FillValue**	**Note**
flag_cor_err_01(time_cor_01)	int	-1	
flag_cor_status_01(time_cor_01)	int	-1	
flag_echo_20_ku(time_20_ku)	short	-1s	
flag_instr_conf_rx_bwdt_20_ku(time_20_ku)	int	-1	
flag_mcd_20_ku(time_20_ku)	int	-1	
stack_kurtosis_20_ku(time_20_ku)	short	-999	This is the default value used in the EE product
stack_skewness_20_ku(time_20_ku)	short	-999	This is the default value used in the EE product
uso_cor_20_ku(time_20_ku)	int	2147483647	It has been observed a negative drift in time of the uso correction, then choosing the max positive value as _FillValue seems to be the safest choice.

Appendix C: Timestamps Data Type

All the timestamps used in the CONFORM products represent the number of seconds since 01/01/2000 in double precision.
In this appendix it is shown that the current choice allows the timestamps to be represented with a precision of 1 microsecond till January 2034.

As the timestamps are typically added to or subtracted from each other, in order to preserve the precision of these operations down to the microsecond, we need to keep the exact representation of the number to 10^{-7}, whose binary representation is around 2^{-23}, i.e. 23 bits are needed to represent the decimal part of the timestamps with a precision of 0.1 microseconds.
The IEEE 754 standard representation for a double precision type reserves 54 bits for the representation of the mantissa (53 bits plus 1 implicitly set), which means that the number of bits left to be used to represent the integer part of the number of seconds is: 53-23 = 30 bits, which means that we have at our disposal 2^{30} -1 = 1,073,741,823 seconds, i.e. 34 years.

Accordingly, the current representation allows us to represent and manage timestamps in the CONFORM without issues in arithmetic operations till January 2034, a date compatible with the mission lifetime.

Appendix D: EE to netCDF migration

The purpose of this section is to give the CryoSat users some insight into the criteria adopted to implement the migration from EE to CONFORM hoping that this can ease the analysis of the products in the new format.

The logic driving the migration is that this operation has to be implemented in two steps:

1. A version of the IPF1 software has to be released that generates baseline C CONFORM products. This IPF1 version as well as the baseline C CONFORM products are hidden versions, i.e. the software is not installed in the operational platform and the products are not distributed but to a selected groups of users to receive their feedback and suggestions for improvements.
2. The first official version of the IPF1 CONFORM software is baseline D that has to generate CONFORM products containing some evolution from baseline C.

Accordingly the contents of this section are applicable to the step one only, i.e. they explain how the baseline C CONFORM products have been designed. As of baseline D, the format will evolve without any relation to the EE format.

The Earth Explorer CryoSat Product consists of two files (Figure 6-1):

- The XML Header File
- The Product File.

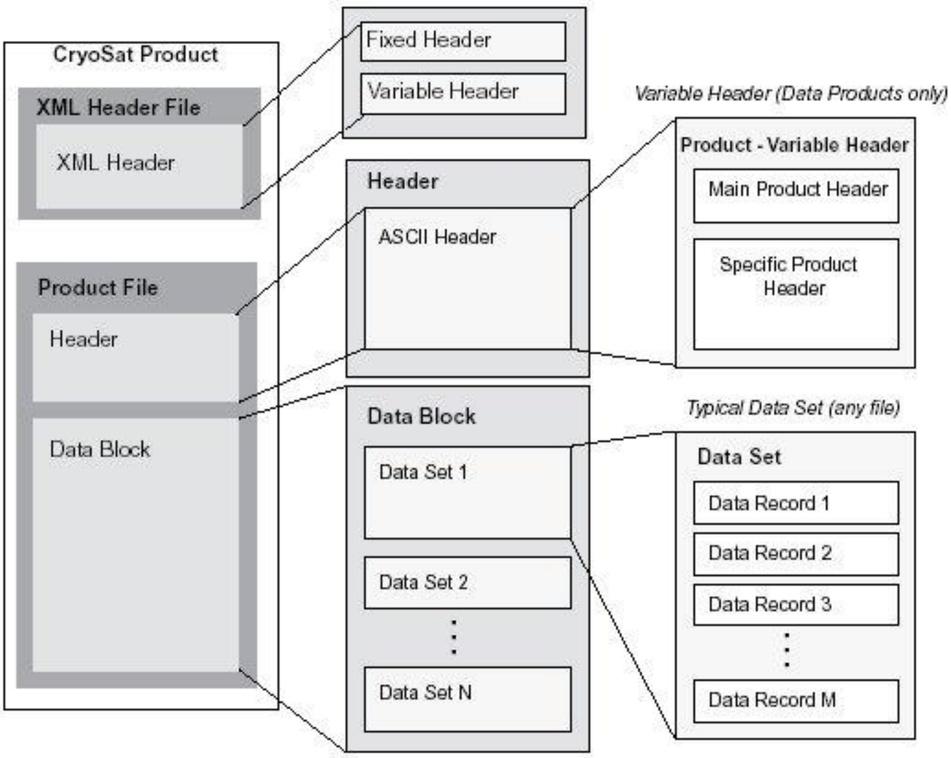

Figure 6-1: EE Product Structure

4.2 THE XML HEADER FILE

The XML Header file contains information identifying the product and easy to read as based on a standard syntax accessed by common tools available for visualising its content. The XML syntax has been chosen for the scope of the PDS.

The XML Header file is composed by:

- a Fixed Header
- a Variable Header

The Fixed Header (hereafter called Standard CryoSat Header) is the common header for all files managed into the PDS. That means it is applied to all files flowing amongst the sub-systems composing the PDS.

The Variable Header (hereafter called Product Header) is the header with format and content depending on the file type and kind of product.

4.2.1 Fixed Header (CryoSat Header)

The Standard CryoSat Header is completely ASCII and based on XML syntax and conventions proposed in [FMT-GUIDE].

The format and content of the Standard CryoSat Header is under ESA responsibility and it is specified in [FMT-GUIDE].

4.2.2 Variable Header (Product Header)

The Variable Header (hereafter called Product Header) for the Level-1 product is composed of:

- a XML Main Product Header (XML MPH)
- a XML Specific Product Header (XML SPH) which includes Reference Data Set Descriptors for external input files and one or more XML Specific Measurement Data Header (XML MDH) for the Data Sets of the Product

The XML MPH and XML SPH are derived from the correspondent headers (MPH and SPH) of the Product File, removing the unused fields and fields already reported in the Standard CryoSat Header.

Each header is completely ASCII and based on XML syntax and conventions proposed in the [FMT-GUIDE].

The following paragraphs describe the format and content of the XML MPH and XML SPH without overload of the XML format description.

4.2.2.1 XML Main Product Header (XML MPH)

Field #	Description	Units	Bytes	Format
	MPH	Tag		
	Product Identification Information			
#01	Product	Tag		
	Product File Name without extension		62	See Section 5
#02	Proc_Stage_Code	Tag		
	Processing stage code identifier: RPRO = Reprocessing OFFL = Routine Operation NRT_ = Near Real Time TEST = Test LTA_ = Long Term Archive		4	4*uc
#03	Ref_Doc	Tag		
	Reference DFCB Document describing the product		23	CS-RS-ACS-ESL-5364 01.07
	Data Processing Information			
#04	Proc_Time	Tag		
	Processing Time (Product Generation Time)		30	UTC=yyyy-mm-ddThh:mm:ss.uuuuuu

Field #	Description	Units	Bytes	Format
#05	Software_Version	Tag		
	Processor Name and software version number		14	ProcessorName/VV.rr
	Orbit Information			
#06	Phase	Tag		
	Phase Code (set to X if not used)		1	uc
#07	Cycle	Tag		
	Cycle Number (set to +000 if not used)		4	%+04d
#08	Rel_Orbit	Tag		
	Relative Orbit Number at sensing start time (set to +00000 if not used)		6	%+06d
#09	Abs_Orbit	Tag		
	Absolute Orbit Number at sensing start time (set to +00000 if not used)		6	%+06d
#10	State_Vector_Time	Tag		
	UTC state vector time		30	UTC=yyyy-mm-ddThh:mm:ss.uuuuuu
#11	Delta_UT1	Tag		
	Universal Time Correction: DUT1 = UT1 – UTC	s	8	%+08.6f
#12	X_Position	Tag		
	X position in Earth Fixed Reference If not used set to +0000000.000	m	12	%+012.3f
#13	Y_Position	Tag		
	Y position in Earth Fixed Reference If not used set to +0000000.000	m	12	%+012.3f
#14	Z_Position	Tag		
	Z position in Earth Fixed Reference If not used set to +0000000.000	m	12	%+012.3f
#15	X_Velocity	Tag		
	X velocity in Earth Fixed Reference If not used set to +0000.000000	m/s	12	%+012.6f
#16	Y_Velocity	Tag		
	Y velocity in Earth Fixed Reference If not used set to +0000.000000	m/s	12	%+012.6f
#17	Z_Velocity	Tag		
	Z velocity in Earth Fixed Reference	m/s	12	%+012.6f

Field #	Description	Units	Bytes	Format
	If not used set to +0000.000000			
#18	State_Vector_Source	Tag		
	Source of Orbit State Vector Record FP = FOS predicted DN = DORIS Level 0 navigator DP = DORIS precise orbit FR= FOS restituted DI = DORIS preliminary		2	2*uc
	Product Confidence Data Information			
#19	Product_Err	Tag		
	Product Error Flag 1 errors have been reported in the Product 0 no errors		1	uc
	Product Size Information			
#20	Tot_Size	Tag		
	Total Size of the Data Product	bytes	21	%021d

Table 2.2.2.1-1: XML Main Product Header Description

4.2.2.2 XML Specific Product Header (XML SPH)

Field #	Description	Units	Bytes	FORMAT
	SPH	tag		
	Product description and identification			
#1	SPH_Descriptor	tag		
	Name describing the Specific Product Header		28	*ProductID SPECIFIC HEADER* *See* Table 5-1
	Product Time information			
	Time_Information	tag		
#2	Start_Record_Time	tag		
	TAI of the first record in the Main MDS of this product		30	TAI=yyyy-mm-ddThh:mm:ss.uuuuuu
#3	Stop_Record_Time	tag		
	TAI of the last record in the Main MDS of this product		30	TAI=yyyy-mm-ddThh:mm:ss.uuuuuu
	Product Orbit information			
	Orbit_Information	Tag		
#4	ABS_Orbit_Start	Tag		
	Absolute Orbit Number at sensing start time.		6	%06d
#5	Rel_Time_ASC_Node_Start	Tag		
	Relative time since crossing ascending node time relative to start time of data sensing.	s	11	%011.6f
#6	ABS_Orbit_Stop	Tag		
	Absolute Orbit Number at sensing stop time.		6	%06d
#7	Rel_Time_ASC_Node_Stop	Tag		

Field #	Description	Units	Bytes	FORMAT
	Relative time since crossing ascending node time relative to stop time of data sensing.	s	11	%011.6f
#8	Equator_Cross_Time	Tag		
	Time of equator crossing at the ascending node relative to the sensing start time.		30	UTC=yyyy-mm-ddThh:mm:ss.uuuuuu
#9	Equator_Cross_Long	Tag		
	Longitude of equator crossing at the ascending node relative to the sensing start time (positive East, 0 = Greenwich) referred to WGS84.	10-6 deg	11	%+011d
#10	Ascending_Flag	Tag		
	Orbit Orientation at the sensing start time A=Ascending D=Descending		1	uc
Product Location Information				
	Product_Location	tag		
#11	Start_Lat	tag		
	WGS84 latitude of the first record in the Main MDS (positive north)	10-6 deg	11	%+011d
#12	Start_Long	tag		
	WGS84 longitude of the first record in the Main MDS (positive East, 0 = Greenwich)	10-6 deg	11	%+011d
#13	Stop_Lat	tag		
	WGS84 latitude of the last record in the Main MDS (positive north)	10-6 deg	11	%+011d
#14	Stop_Long	tag		

Field #	Description	Units	Bytes	FORMAT
	WGS84 longitude of the last record in the Main MDS (positive East, 0 = Greenwich)	10-6 deg	11	%+011d
	SIRAL Level 0 Quality information			
	Level_0_Confidence_Data	tag		
#15	L0_Proc_Flag	tag		
	Processing errors significance flag 1 errors (percentage of errors greater than threshold) 0 no errors		1	uc
#16	L0_Processing_Quality	tag		
	Percentage of quality checks successfully passed during ISP processing (max allowed +10000)	10-2 %	6	%+06d
#17	L0_Proc_Thresh	tag		
	Minimum acceptable percentage of quality threshold that must be passed during ISP processing (max allowed +10000)	10-2 %	6	%+06d
#18	L0_Gaps_Flag	tag		
	Flag to indicate gaps in input data • 1 gaps • 0 no gaps		1	uc
#19	L0_Gaps_Num	tag		
	Number of gaps detected during ISP processing		7	%07d
	SIRAL Instrument Configuration			
	SIR_Instrument_Configuration	tag		
#20	Instrument_Identifier	tag	1	1*uc A (SIRAL Nominal) B (SIRAL Redundant)
#21	SIR_Op_Mode	tag		

Field #	Description	Units	Bytes	FORMAT
	SIRAL Operative Mode		10	10*uc LRM_______ SAR_______ SARIN_____ CAL1_LRM__ CAL1_SAR__ CAL1_SARIN CAL2_SAR__ CAL2_SARIN ACQ_______ TRK_SARIN_ TRK_SAR___ CAL4______
#22	SIR_Configuration	tag		
	SIRAL Rx Configuration		7	7*uc RX_1___ RX_2___ BOTH___ UNKNOWN
Level 1 Surface Statistics				
	Surface_Statistics	tag		
#23	Open_Ocean_Percent	tag		
	Percentage of output L1B records detected on open ocean or semi-enclosed seas	10-2 %	6	%+06d
#24	Close_Sea_Percent	tag		
	Percentage of output L1B records detected on close seas or lakes	10-2 %	6	%+06d
#25	Continent_Ice_Percent	tag		
	Percentage of output L1B records detected on continental ice	10-2 %	6	%+06d
#26	Land_Percent	tag		
	Percentage of output L1B records detected on land	10-2 %	6	%+06d
SIRAL Level 1 Processing information				
	Level_1_Confidence_Data	tag		

Field #	Description	Units	Bytes	FORMAT
#27	L1B_Prod_Status	tag		
	Complete/Incomplete Product Completion Flag (0 or 1). 1 if the product has a duration shorter than the input Level 0		1	uc
#28	L1B_Proc_Flag	tag		
	Processing errors significance flag 1 errors (percentage of errors greater than threshold) 0 no errors		1	uc
#29	L1B_Processing_Quality	tag		
	Percentage of quality checks successfully passed during Level 1B processing (max allowed +10000)	10-2 %	6	%+06d
#30	L1B_Proc_Thresh	tag		
	Minimum acceptable percentage of quality threshold that must be passed during Level 1B processing (max allowed +10000)	10-2 %	6	%+06d
Data Set Descriptors				
	DSDs	tag		
	List_of_DSDs	tag		
	Data_Set_Descriptor	tag		
#31	Data_Set_Name	tag		
	Name of the Data Set		28	uc
#32	Data_Set_Type	tag		
	M for Measurement – R for Reference		1	uc
#33	File_Name	tag		
	Name of the reference file. Field is left empty for Measurement DSD		62	uc
#34	Data_Set_Offset	tag		
	Offset in bytes from the beginning of the DBL file. For reference DSDs the field is set to 0.	bytes	21	%+021d
#35	Data_Set_Size	tag		

Field #	Description	Units	Bytes	FORMAT
	Size in bytes of the Measurement Data Set Record. For reference DSDs the field is set to 0.	bytes	21	%+021d
#36	Num_of_Records	tag		
	Number of Data Set Records. For reference DSDs the field is set to 0.		11	%+011d
#37	Record_Size	tag		
	Record size in bytes. For reference DSDs the field is set to 0.	bytes	11	%+011d
#38	Byte_Order	tag		
	It describes the endianess of the data set 3210 → Big-endian 0123 → Little-endian For Reference DSDs the field is left empty		4	%4c 3210 for CryoSat

Table 2.2.2.2-1: XML Specific Product Header description

Main relevant content of XML Header File is reported in the Global Attribute section of the netcdf product, in any case the XML Header File Product will be generated for Legacy.

4.3 THE PRODUCT FILE

The EE Product File is defined taking the ENVISAT Level 0 products as a template and consists of:

- Main Product Header (MPH)
- Specific Product Header (SPH)
- Data Sets (DS)

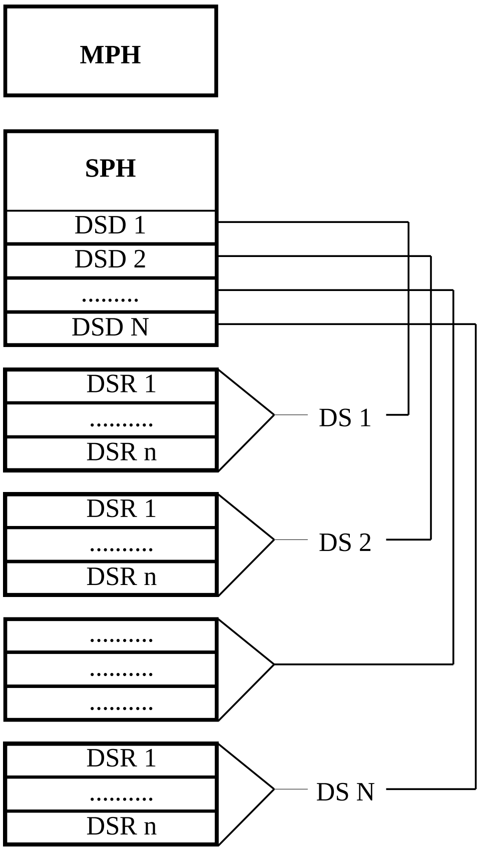

Figure 6-2: EE Product File Structure

The MPH and SPH blocks are ASCII whereas the Data Sets are completely binary and each of them contains one or more Data Set Records.

All the EE CryoSat Products that have migrated to the netCDF format contain one DS.

The general rules driving the migration are:

- The contents of the MPH and SPH have to be converted into netCDF global attributes
- each DS fields has been converted into a netCDF variable
- Grouping within the product is only logical (i.e. the group feature of the netCDF 4.0 is not used but the rationale is kept in the variable naming)
- Three time dimensions are used:
    - One time stamp for each 1 Hz measurement.
    - One time stamp for each 20 Hz measurement.

  - One time stamp to tag the time when the correction is applied.
- 20 Hz measurements are linked to the corresponding 1 Hz measurement by means of one index.
- _FillValue attribute is always filled with limited exceptions.
- Coding of binary flags:
  - For flags coded in a single bit the same convention as S6 GPP is used
  - For flags coded on more than one bit, a variable will be created

5 CRYOSAT LEVEL-1 EEF PRODUCTS

The following table provides the Product Identification for each product generated by the IPF1.

Product Identification	Description
SIR1LRC11B	Level-1 CAL1 Low Rate Mode (Rx1 Channel)
SIR2LRC11B	Level-1 CAL1 Low Rate Mode (Rx2 Channel)
SIR1SAC11B	Level-1 CAL1 SAR Mode (Rx1 Channel)
SIR2SAC11B	Level-1 CAL1 SAR Mode (Rx2 Channel)
SIR_SIC11B	Level-1 CAL1 SARin Mode
SIR_SICC1B	Level-1 CAL1 SARIN Exotic Data
SIR1SAC21B	Level-1 CAL2 SAR Mode (Rx1 Channel)
SIR2SAC21B	Level-1 CAL2 SAR Mode (Rx2 Channel)
SIR1SIC21B	Level-1 CAL2 SARin Mode (Rx1 Channel)
SIR2SIC21B	Level-1 CAL2 SARin Mode (Rx1 Channel)
SIR1LRM_0M	LRM and TRK Monitoring Data from Rx 1 Channel
SIR2LRM_0M	LRM and TRK Monitoring Data from Rx 2 Channel
SIR1SAR_0M	SAR Monitoring Data from Rx 1 Channel
SIR2SAR_0M	SAR Monitoring Data from Rx 1 Channel
SIR_SIN_0M	SARIN Monitoring Data
SIR_SIC40M	CAL4 Monitoring Data

Table 5-1 L1b Product List

5.1 FILE NAMES

The file name of each Level-1 product follows what specified in [MASTER-ICD], i.e.:

MM_CCCC_TTTTTTTTTT_yyyymmddThhmmss_YYYYMMDDTHHMMSS_bvvv.HDR
MM_CCCC_TTTTTTTTTT_yyyymmddThhmmss_YYYYMMDDTHHMMSS_bvvv.DBL

where

MM is the mission identifier **CS** for CryoSat

CCCC is the file class (i.e.: OPER for routine operation, NRT_ for Near Real Time, RPRO for Reprocessing, TEST for Testing or TIxx for stand alone IPF1 testing associated to Test Data Sets tagged as Tixx, LTA_ for products generated in the Long Term Archive).

TTTTTTTTTT is the file type and corresponds to the Product ID of the Table 3-1

yyyymmddThhmmss is the validity start time and correspond to the time of the first valid record stored in the Interim FBR.

YYYYMMDDTHHMMSS is the validity stop time and correspond to time of the last valid record stored in the Interim FBR.

b is the baseline identifier as read-in from the PCONF

vvv is the version number

For example in case of an operational Level-1 product of the SIRAL instrument in Low Rate Mode in baseline number A and version 1 the name could be:

CS_OPER_ SIR_LRM1B_20030624T075728_20030624T080231_A001.HDR
CS_OPER_ SIR_LRM1B_20030624T075728_20030624T080231_A001.DBL

The file with extension ***.HDR*** is the xml Header and the file with the extension ***.DBL*** is the Level 1b Product file.

Appendix E: ncdump referente template

In annex to the current document, the reference template representative of the product netcdf metadata are included.

The folder includes the following templates:

- FBR_SAR: Full Bit Rate cdl dump for the SAR mode
- FBR_SARin: Full Bit Rate cdl dump for the SARin mode
- L1BSar: Level 1B cdl dump for the SARSARin mode
- L1B: Level 1B cdl dump for the LRM mode
- L1Bs_SAR: Level 1B Stack cdl dump for SAR/SARin modes

END OF DOCUMENT